AIR QUALITY TECHNICAL REPORT

MD 295 Project Planning Study

ANNE ARUNDEL AND HOWARD COUNTIES, MARYLAND

September 2007

Maryland State Highway Administration
707 North Calvert Street
Baltimore, MD 21202

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I. SUMMARY

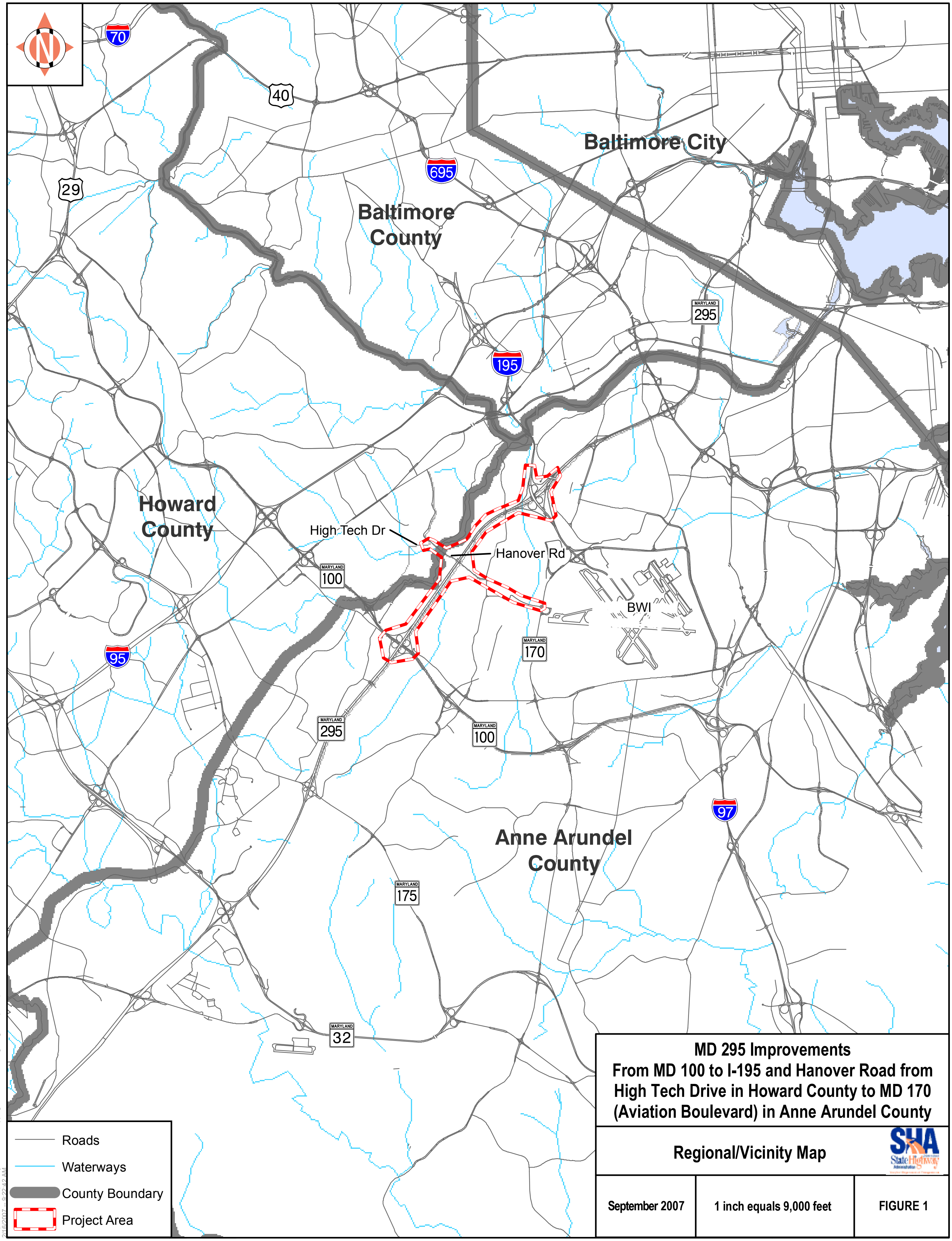
A. Project Description

The Maryland State Highway Administration (SHA) is conducting a Project Planning Study for MD 295 in Anne Arundel and Howard counties. The study area extends from MD 100 north to Interstate 195 (I-195), a distance of approximately three miles. The project also extends along Hanover Road from High Tech Drive east to MD 170 (Aviation Boulevard), a distance of approximately 1.5 miles (See Figures 1 and 2).

The purpose of this project is to improve the existing capacity, traffic operations and safety of MD 295. The purpose of this project is also to enhance Hanover Road as a secondary access to Baltimore-Washington International/Thurgood Marshall Airport (BWI) and the surrounding areas. Currently I-195 serves as the primary access to BWI and BWI area services. By improving MD 295 and Hanover Road, the project will improve connectivity between the Baltimore and Washington Metropolitan Regions as it relates to BWI and will support existing and planned economic development in and around BWI.

MD 295 is classified as an urban freeway/expressway with full access control (a limited access four-lane divided freeway). This facility serves as a major north-south state route between the Baltimore and Washington D.C. Metropolitan Regions, and is also known as the Baltimore Washington Parkway. MD 295 is also a major access connector to BWI from both the Baltimore and Washington D.C. Metropolitan Regions. Hanover Road is classified as a two-lane minor arterial that provides service to both airport related- and local traffic.

Recent BWI service expansion has begun to utilize Stoney Run Road for service support operations. One example of this is a consolidated rental car facility recently built. In addition to the private sector, state government services such as the Maryland Department of Transportation (MDOT) and Maryland Aviation Administration (MAA) have expanded their facilities in the area. Due to the expansion of private and government facilities in the area, a heavier traffic demand will be placed on MD 295 and Hanover



70
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29
695
195
295
95
100
170
175
32
97
Baltimore City
Baltimore County
Howard County
Anne Arundel County
High Tech Dr
Hanover Rd
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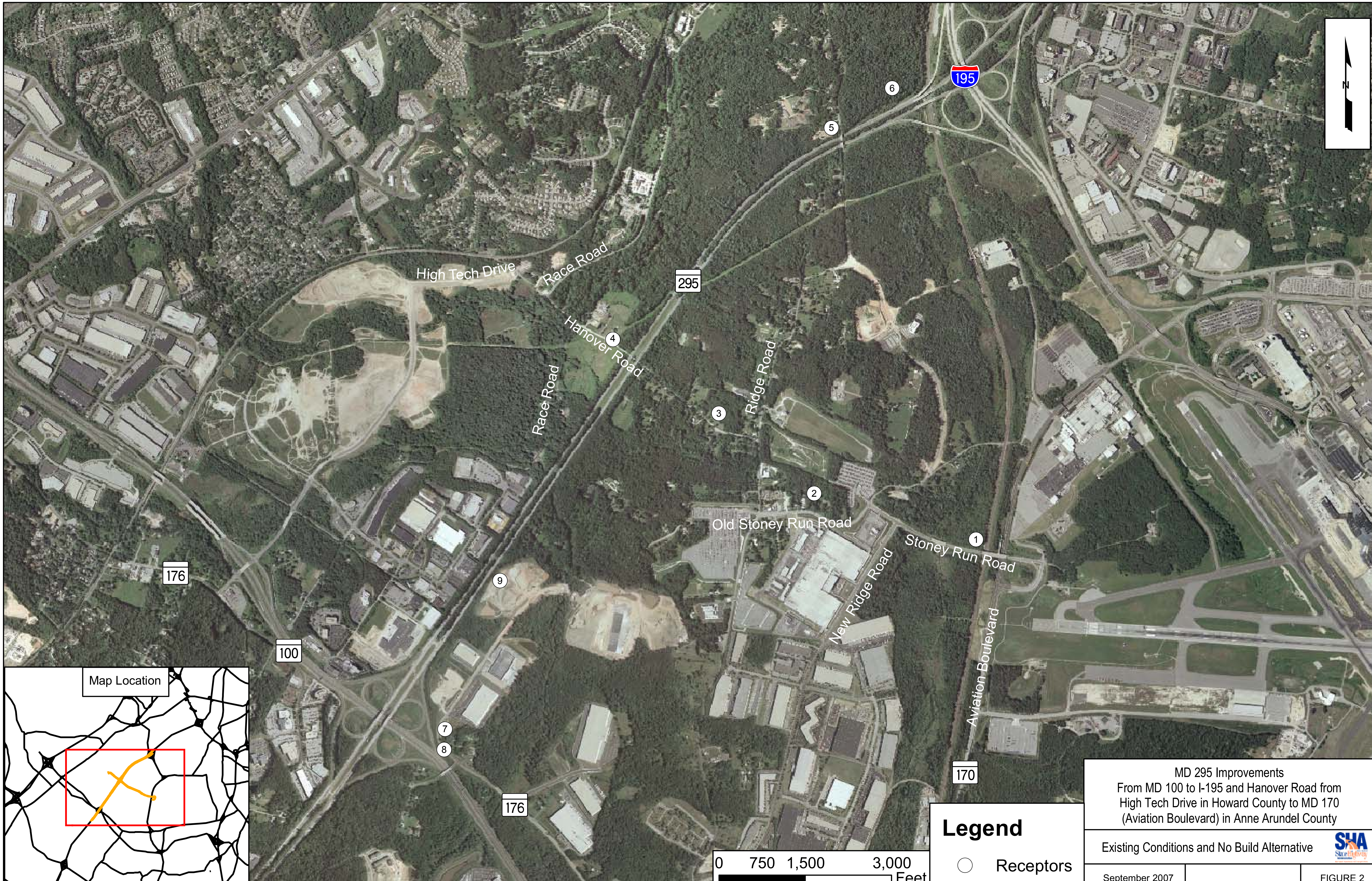
From MD 100 to I-195 and Hanover Road from High Tech Drive in Howard County to MD 170 (Aviation Boulevard) in Anne Arundel County
Regional/Vicinity Map
SHA
September 2007
1 inch equals 9,000 feet
FIGURE 1



MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County

Existing Conditions and No Build Alternative

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FIGURE 2

Road which is a major cross road to Stoney Run Road. MD 295 is included in the 2004 Highway Needs Inventory for expansion to six lanes and a new interchange at Hanover Road, and has been identified as a priority by Anne Arundel County in the 2003 and 2005 priority letters.

Improvements being considered for the study area will address one of the fastest growing areas of Anne Arundel County. Large developments such as Arundel Mills Mall and the BWI Business District have all contributed to increased traffic volumes in the area. The BWI Business District is also expected to grow dramatically. The BWI Airport is a major facilitator of economic growth not only in the immediate area, but in the entire Baltimore-Washington D.C. Metropolitan Region. BWI serves the fourth largest consumer population and travel market in the United States. Over the past fifteen years, passenger volume has more than doubled and is forecast to continue its growth in the Coordinated Transportation Vision for the BWI Region.

To support some of the predicted growth and the need for improvements in the study area, BWI is undergoing a $1.8 billion expansion program to provide additional convenient parking, improve vehicle and pedestrian access, and expand the capacity of the airport terminal. The number of origin and destination passengers is forecasted to grow to nearly 35 million annual passengers by 2020. An increased number of origin-destination passengers will increase demand on transportation facilities. Currently, BWI generates over 60,000 vehicle trips per day in the terminal core area alone. It is estimated that, overall, BWI and related development may generate in excess of two million vehicle miles of travel per day.

The current project evaluates seven alternatives (No-Build and six build alternatives) that have been retained for detailed study. All the build alternatives (Alterative 3, 3A, 4, 4A, 7, and 8) include the same proposed widening of MD 295 from four to six lanes, a new interchange at Hanover Road, an extension of Hanover Road eastward from Ridge Road to Old Stoney Road, and straightening and widening Hanover Road to a four-lane divided roadway with a 20-foot median, 12-foot inside lane, 16-foot outside lane to accommodate bicyclists, a 10-foot hiker biker trail on the north side of Hanover Road, and a 5-foot sidewalk on the south side of Hanover Road from High Tech Drive to Corporate Center Drive/New Ridge Road. East of Corporate Center Drive/New Ridge Road, Hanover Road would be widened to a four-lane undivided roadway with a 10-foot hiker biker trail on the north side. All of the build alternatives also would include a direct access ramp from southbound MD 170 (Aviation Drive) to Stoney Run Road and a direct access ramp from Stoney Run Road to southbound MD 170. The direct access ramps do not affect the air quality analysis because the micro-scale modeling was focused on the three project intersections with the worst-case, future Levels of Service, and none of those signalized intersections occur at the juncture of Stoney Run Road and MD 170.

The build alternatives differ among the interchange design proposed at Hanover Road, and between two alternative alignments for Hanover Road. Alternatives 3 and 4 keep Hanover Road on its existing alignment while Alternatives 3A, 4A, 7, and 8 relocate Hanover Road approximately 200 feet south of the existing alignment. The No-Build and six build alternatives are described below.

Widening of MD 295

MD 295 would be widened from a four-lane roadway (two through lanes in each direction) to a six-lane roadway with three through lanes in each direction. The additional width would include a 12-foot travel lane with a 10-foot shoulder constructed within the median of MD 295 in each direction, from south of the MD 100 interchange to north of the I-195 interchange. The northern limit of the MD 295 widening would tie into another MD 295 project from I-195 to just south of I-695 (see Figures 3 and 4).

Alternative 1 – No-Build

Alternative 1 proposes no changes to the existing facilities within the project study area other than minor short-term improvements that would occur as part of normal safety and maintenance operations.

Alternatives 3 and 3A – Compressed Diamond Interchange

Alternative 3 proposes a compressed diamond interchange at MD 295 and Hanover Road. Ramps to and from MD 295 would meet Hanover Road at a signalized intersection on either side of MD 295. This alternative integrates the interchange-specific design features of the widening of MD 295 with Hanover Road improvements along its existing alignment. *Alternative 3A* integrates the interchange-specific design features of the widening of MD 295 with Hanover Road improvements along the relocated Hanover Road alignment (see Figure 5).

Alternative 4 and 4A – Single Point Urban Interchange

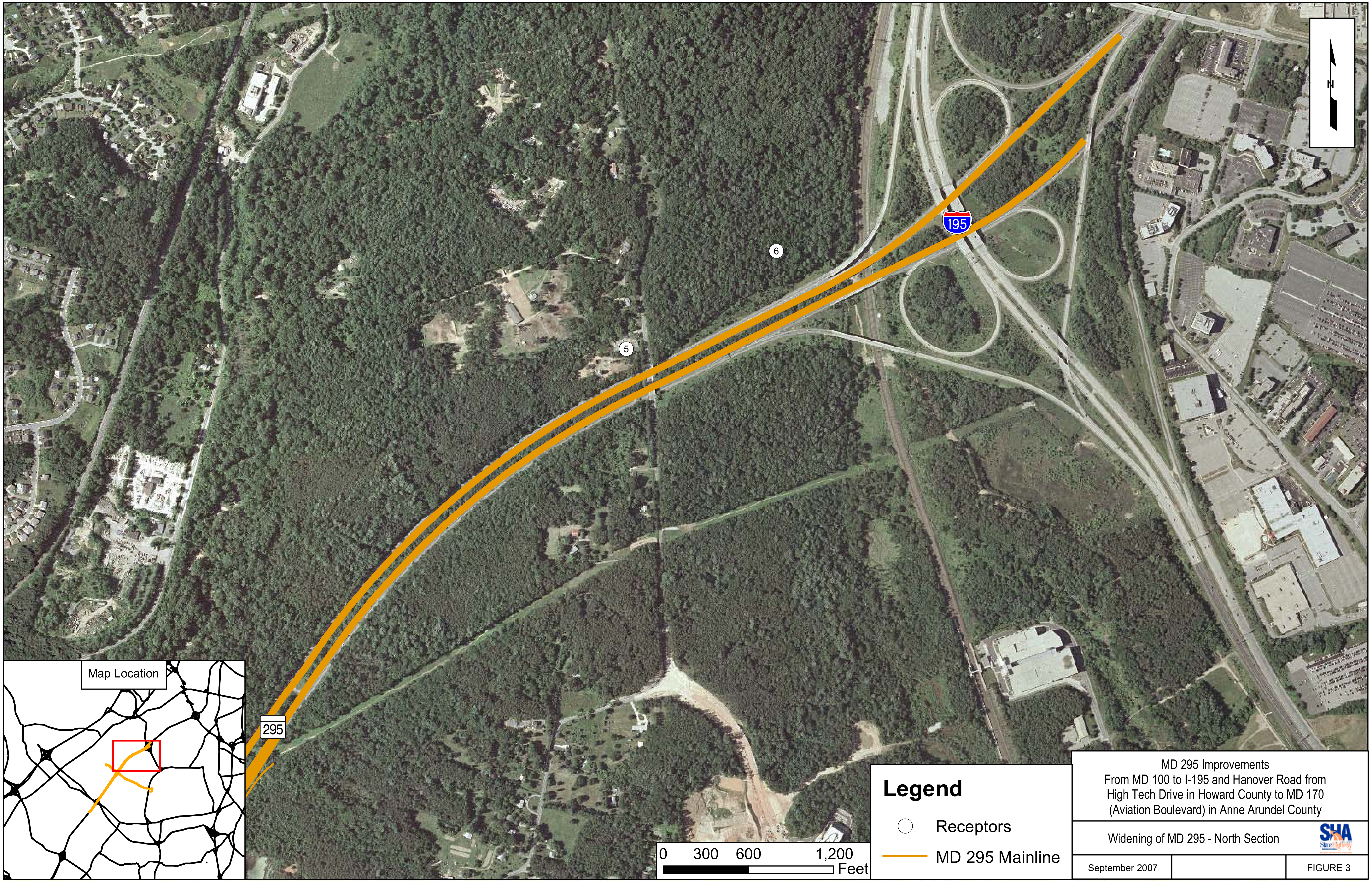
Alternative 4 proposes a single point urban interchange (SPUI). While similar to traditional diamond interchanges, SPUI ramps curve inward and meet at a single traffic signal below or underneath the bridge, allowing opposing left turning movements to occur simultaneously. This alternative integrates the interchange-specific design features of the widening of MD 295 with Hanover Road improvements along its existing alignment. *Alternative 4A* integrates the interchange-specific design features of the widening of MD 295 with Hanover Road improvements along the relocated Hanover Road alignment (see Figure 6).

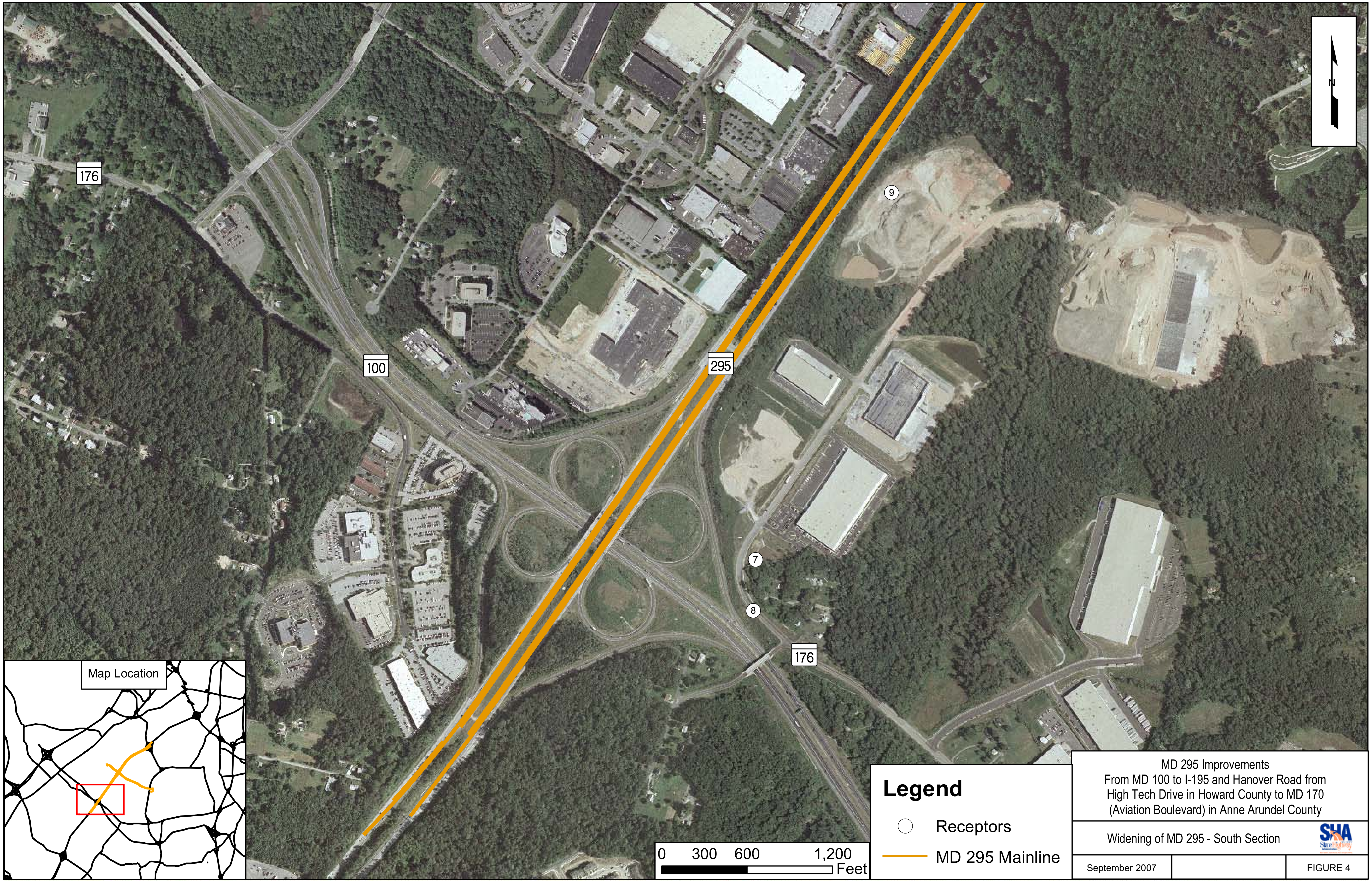
Alternative 7 - South Alignment of Hanover Road with Loop and Half Diamond Interchange

Alternative 7 proposes no ramps in the northwestern quadrant of the proposed Hanover Road interchange to minimize impacts to the park and wetlands as well as the residential area that is also in the quadrant. A loop ramp is proposed in the southwestern quadrant of the interchange to allow movement from southbound MD 295. This alternative integrates the interchange-specific design features of the widening of MD 295 with the relocated Hanover Road alignment (see Figure 7).

Alternative 8 - Diverging Diamond Interchange

The Diverging Diamond Interchange switches traffic, at the ramp terminals, over to the opposite side of the roadway within the interchange. This promotes left-turn movements and eliminates the left-turn signal phase improving the interchange's efficiency. This traffic pattern improves capacity and minimizes the length of the queues which can normally cause failure within a diamond interchange. This alternative integrates the interchange-specific design features of the widening of MD 295 with the relocated Hanover Road alignment (see Figure 8).


6
5
195
295
N
Map Location
Legend
Receptors
MD 295 Mainline
0 300 600 1,200
Feet
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County
Widening of MD 295 - North Section
SHA
September 2007
FIGURE 3


176
100
295
176
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8
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Map Location
Legend
Receptors
MD 295 Mainline
0 300 600 1,200
Feet
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County
Widening of MD 295 - South Section
SHA
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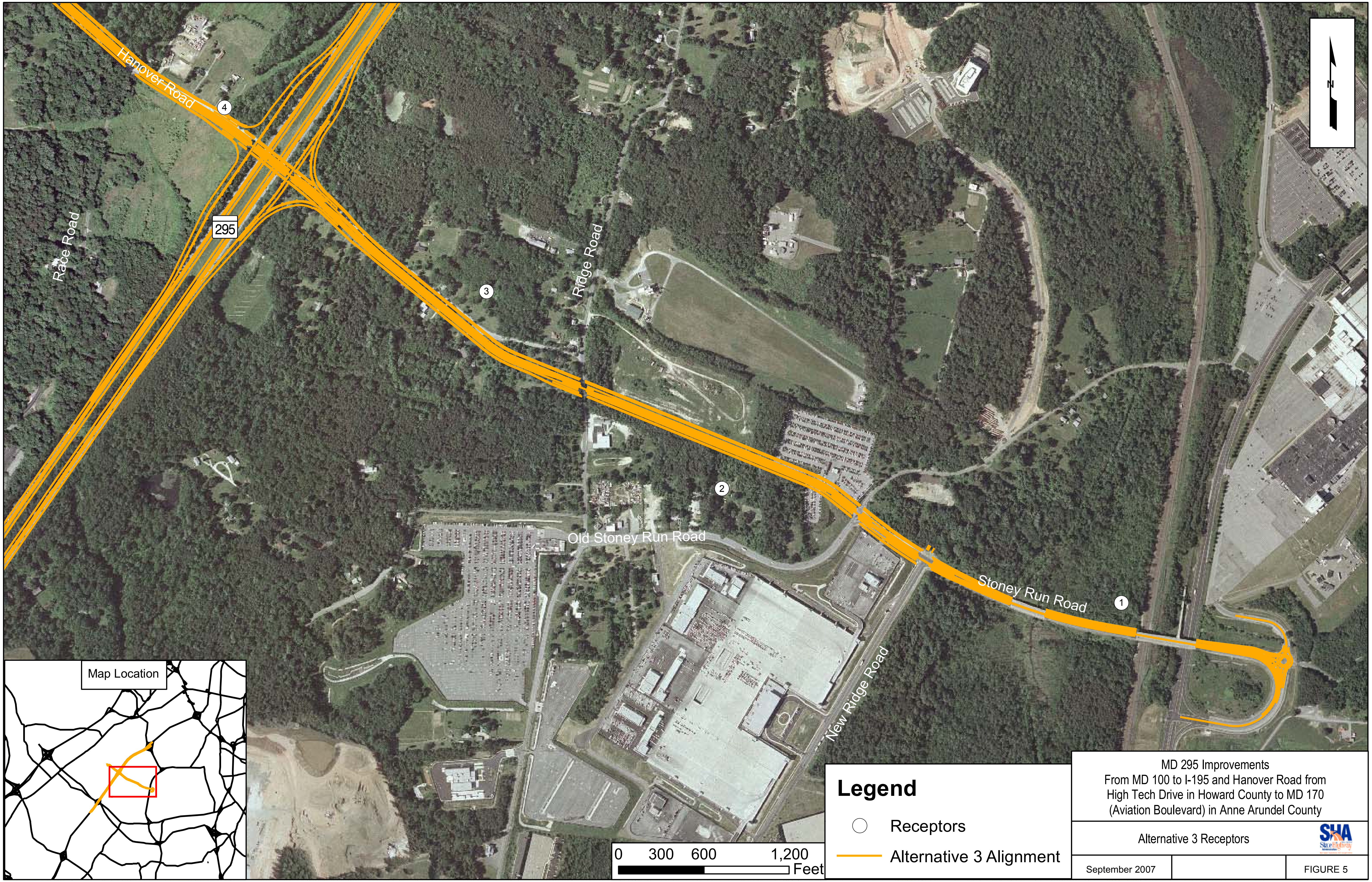
FIGURE 4



MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County

Alternative 3 Receptors

SHA

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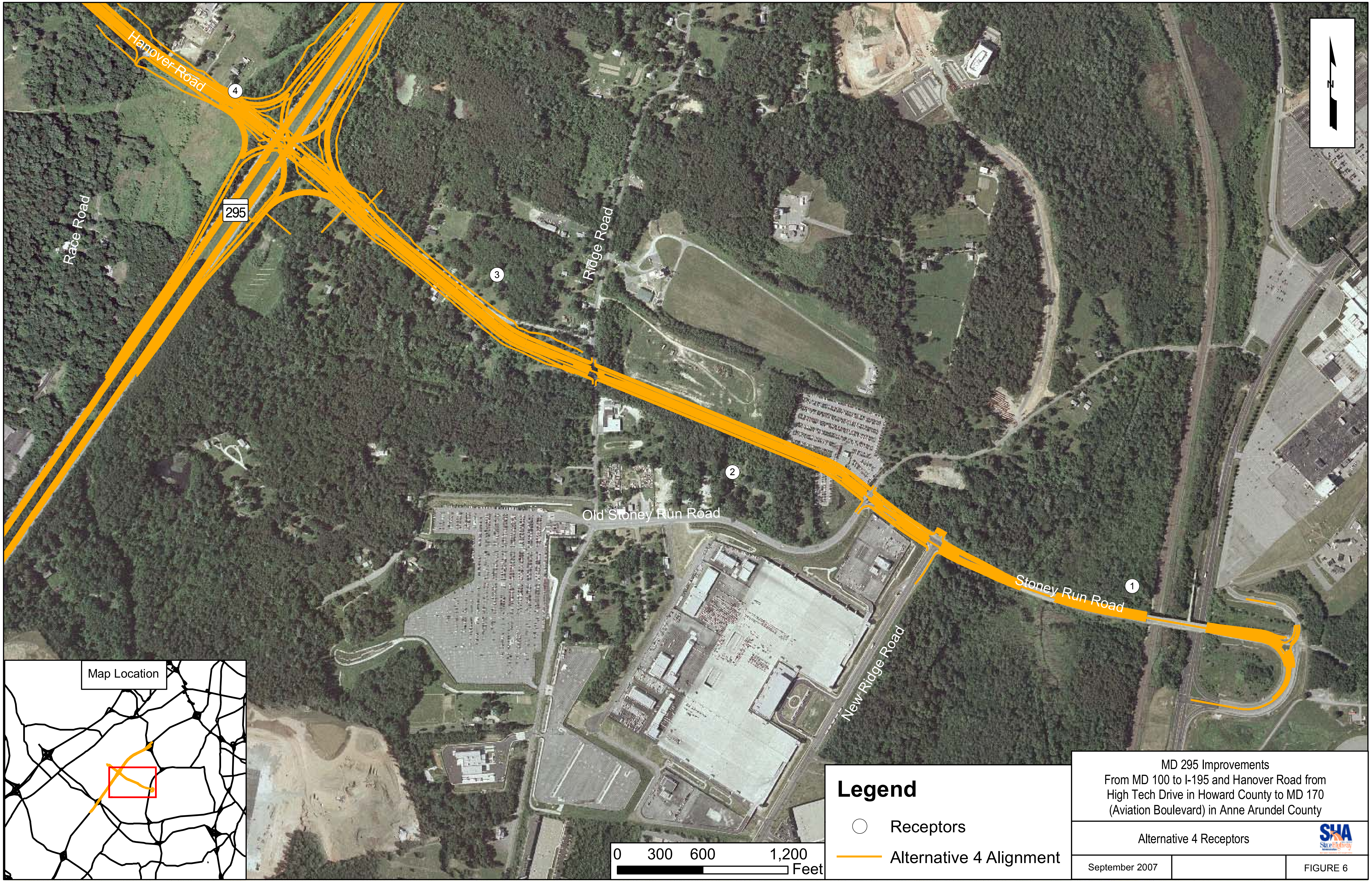
FIGURE 5



Hanover Road
Race Road
295
Ridge Road
Old Stoney Run Road
Stoney Run Road
New Ridge Road
1
2
3
4
N
Map Location
Legend
Receptors
Alternative 4 Alignment
0 300 600 1,200
Feet
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from High Tech Drive in Howard County to MD 170 (Aviation Boulevard) in Anne Arundel County
Alternative 4 Receptors
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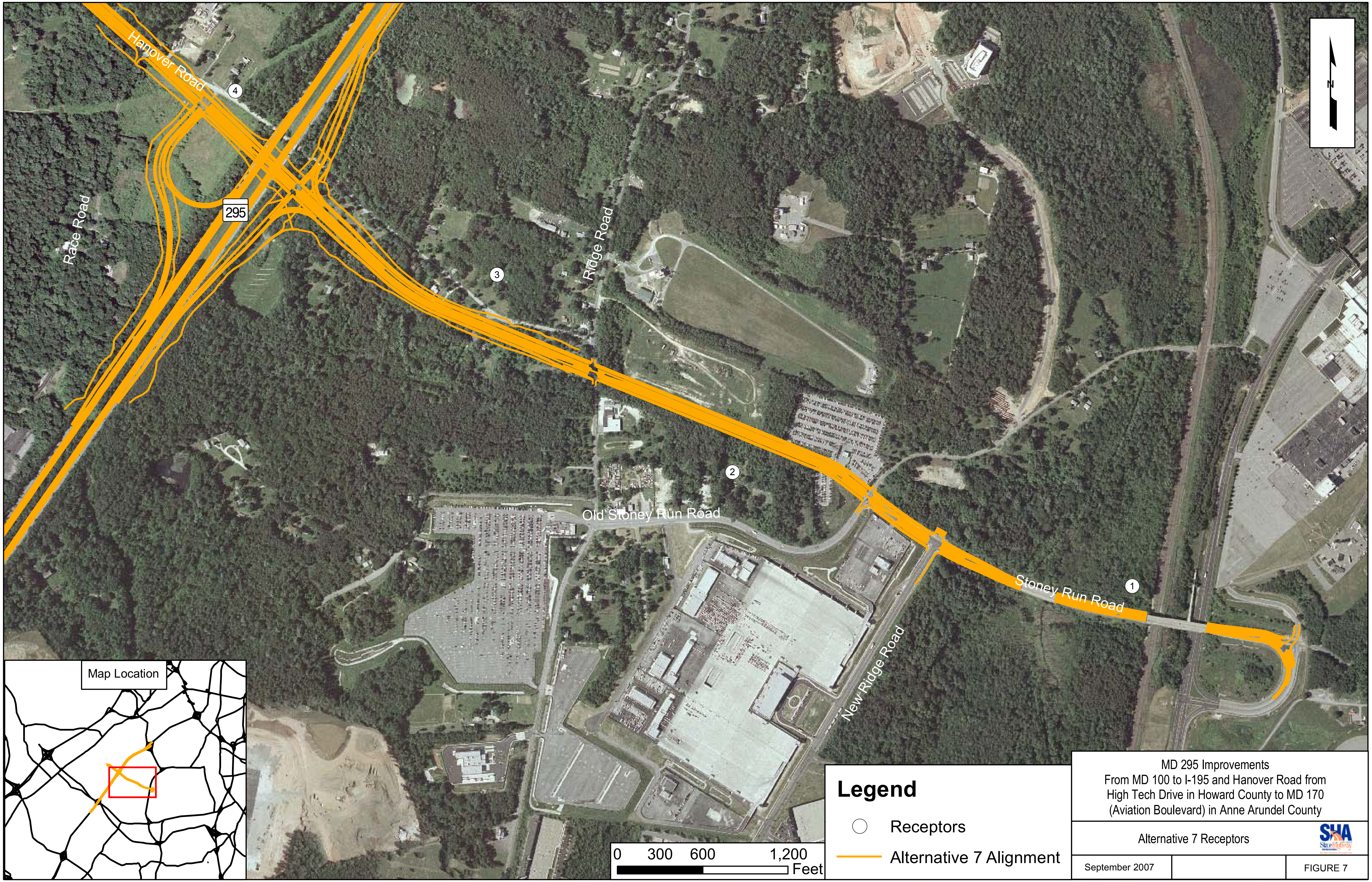
FIGURE 6


Hanover Road
295
Race Road
Ridge Road
Old Stoney Run Road
Stoney Run Road
New Ridge Road
1
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4
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Map Location
Legend
Receptors
Alternative 7 Alignment
0 300 600 1,200
Feet
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County
Alternative 7 Receptors
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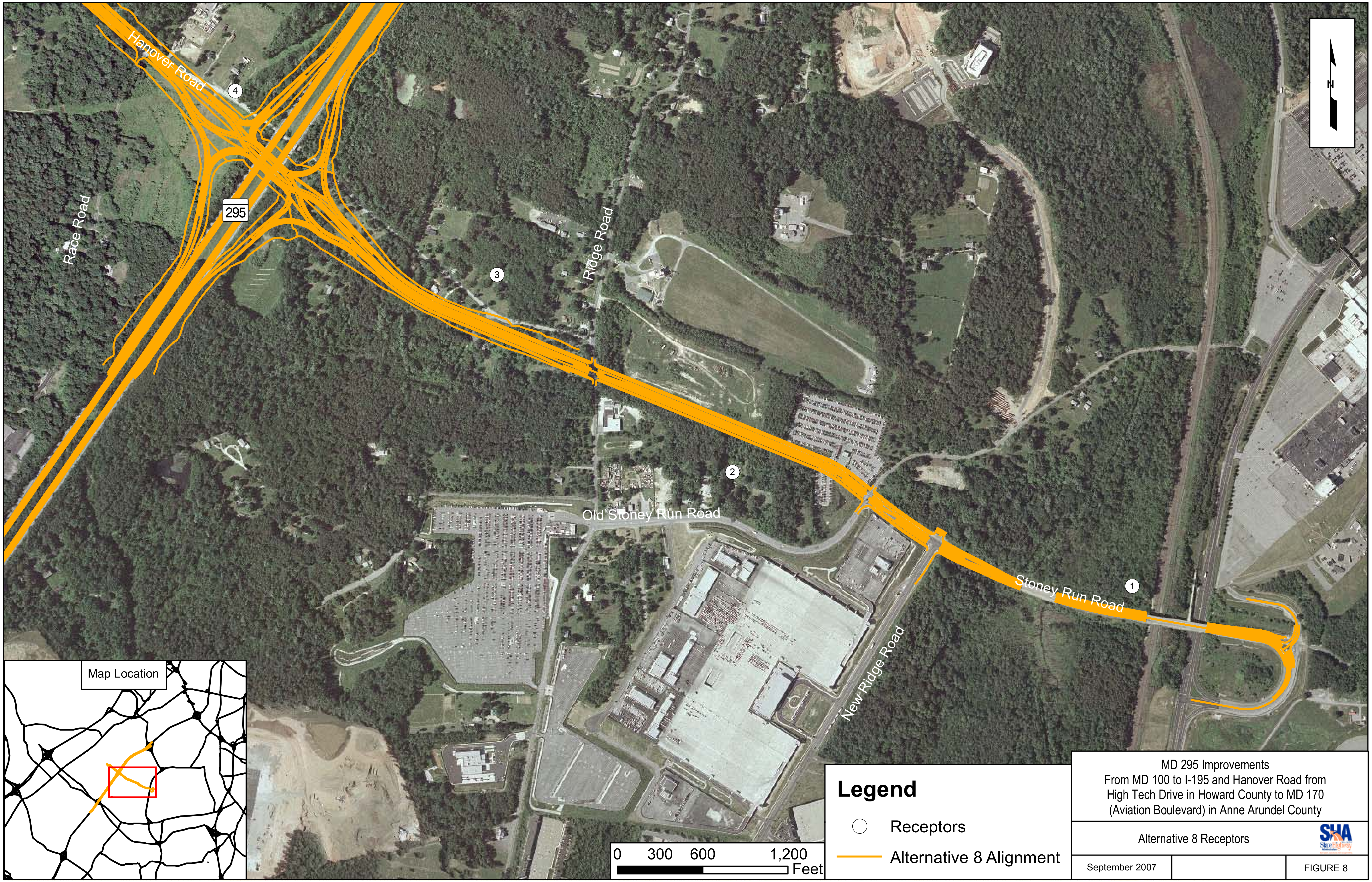
FIGURE 7



Hanover Road
295
Race Road
Ridge Road
Old Stoney Run Road
Stoney Run Road
New Ridge Road
1
2
3
4
N
Map Location
0 300 600 1,200
Feet
Legend
Receptors
Alternative 8 Alignment
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County
Alternative 8 Receptors
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FIGURE 8

B. Objectives and Type of Analysis

This air quality analysis has been completed in accordance with U.S. Environmental Protection Agency (EPA), Federal Highway Administration (FHWA), and SHA guidelines.

Carbon Monoxide (CO) predictions were analyzed as the accepted indicator for vehicle induced air pollution. The EPA accepts the MOBILE 6.2 emissions factor models and CAL3QHC dispersion models to predict CO concentrations for the existing year (2004 data) and the design year (2030). These models predict current and future air quality impacts based on CO pollutant concentrations at a variety of sites in the project corridor. Computer modeled one-hour concentration levels are combined with background concentrations and used to derive the eight-hour concentration levels, which are then compared to the National Ambient Air Quality Standards (NAAQS). The objective of this analysis is to consider the affects of the project on the local ambient air quality relative to the NAAQS. This is done to establish that proposed transportation improvement projects conform to the Clean Air Act (CAA) Amendments of 1990 and the Maryland State Implementation Plan (SIP).

A total of 69 receptors were used to predict both free-flow and idling condition CO concentrations for each of the alternatives in the project area. These receptors were selected to represent areas of possible human use at or near the facility, as well as sites in close proximity to intersections that produce worst-case concentration levels. See Section II of this report for details regarding the CO modeling effort. Based on available traffic data, 2004 was used as the existing year and 2030 was used as the design year for the project air quality modeling.

C. Conclusions

The air quality modeling analysis evaluated traffic conditions for the existing facility (2004), Alternative 1 No-Build (2030), and all Build Alternatives (2030). The analysis indicates that the eight-hour concentration of CO will not exceed the NAAQS of 9.0 ppm (parts per million) at any sites within the project area for any of the alternatives, including the existing facility and No-Build options.

The maximum calculated eight-hour CO concentrations are as follows:

- 3.7 ppm for the existing facility;
- 4.1 ppm for Alternative 1 (No-Build);
- 3.2 ppm for Alternatives 3 and 3A;
- 3.2 ppm for Alternatives 4 and 4A;
- 3.2 ppm for Alternative 7; and
- 3.2 ppm for Alternative 8.

Please note that the 8-hour NAAQS for CO is 9 ppm, and is not exceeded by any of these alternatives or design years. Although CO concentrations are typically anticipated to decrease in the future due to lower fleet emissions, the relatively steady-state of CO emissions in both the existing and future case for this project are due to anticipated increases in traffic volumes and the effects of traffic queuing on local roadway intersections along common areas of Hanover Road.

D. Conformity with Regional Air Quality Planning

The MD 295/Hanover Road Improvements Project is located in Howard and Anne Arundel Counties, Maryland. Howard and Anne Arundel Counties are not designated as non-attainment for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). As of June 20, 2007 Howard and Anne Arundel Counties are listed as "moderate non-attainment" relative to the NAAQS for eight-hour ozone (O_3) and "non-attainment" relative to fine particulates ($PM_{2.5}$). Since the projects is located in a non-attainment area for O_3 and $PM_{2.5,}$ conformity to the State Implementation Plan (SIP) is determined through a regional air quality analysis performed on the Transportation Improvement Plan (TIP) and transportation plan. This project conforms to the SIP as it originates from a conforming TIP and transportation plan (Appendix A, TIP Project Reference# 61-051-41). Although there are S/NAAQS for $PM_{2.5}$ and the study area is within designated $PM_{2.5}$ non-attainment areas, EPA has not promulgated regulations to achieve $PM_{2.5}$ attainment. A revised SIP which includes $PM_{2.5}$ attainment is not due until 2008.

E. Construction Impacts

The construction phase of the proposed project has the potential to impact the local ambient air quality by generating fugitive dust through activities such as demolition and materials handling. The SHA has addressed this possibility by establishing "Specifics for Construction and Materials" which specifies procedures to be followed by contractors involved in site work.

The Maryland Air and Radiation Management Administration was consulted to determine the adequacy of the "Specifications" in terms of satisfying the requirements of the "Regulations Governing the Control of Air Pollution in the State of Maryland". The Maryland Air and Radiation Management Administration found the specifications to be consistent with the requirements of these regulations. Therefore, during the construction phase, all appropriate measures (Code of Maryland Regulations 26.11.06.03D) would be incorporated to minimize the impact f proposed transportation improvements on the air quality of the area.

F. Agency Coordination

Copies of this Air Quality Analysis were distributed to the EPA, FHWA, Maryland Department of the Environment (MDE), and the Maryland Air and Radiation Management Administration for review and comment.

II. ANALYSIS

A. Receptor Site Location

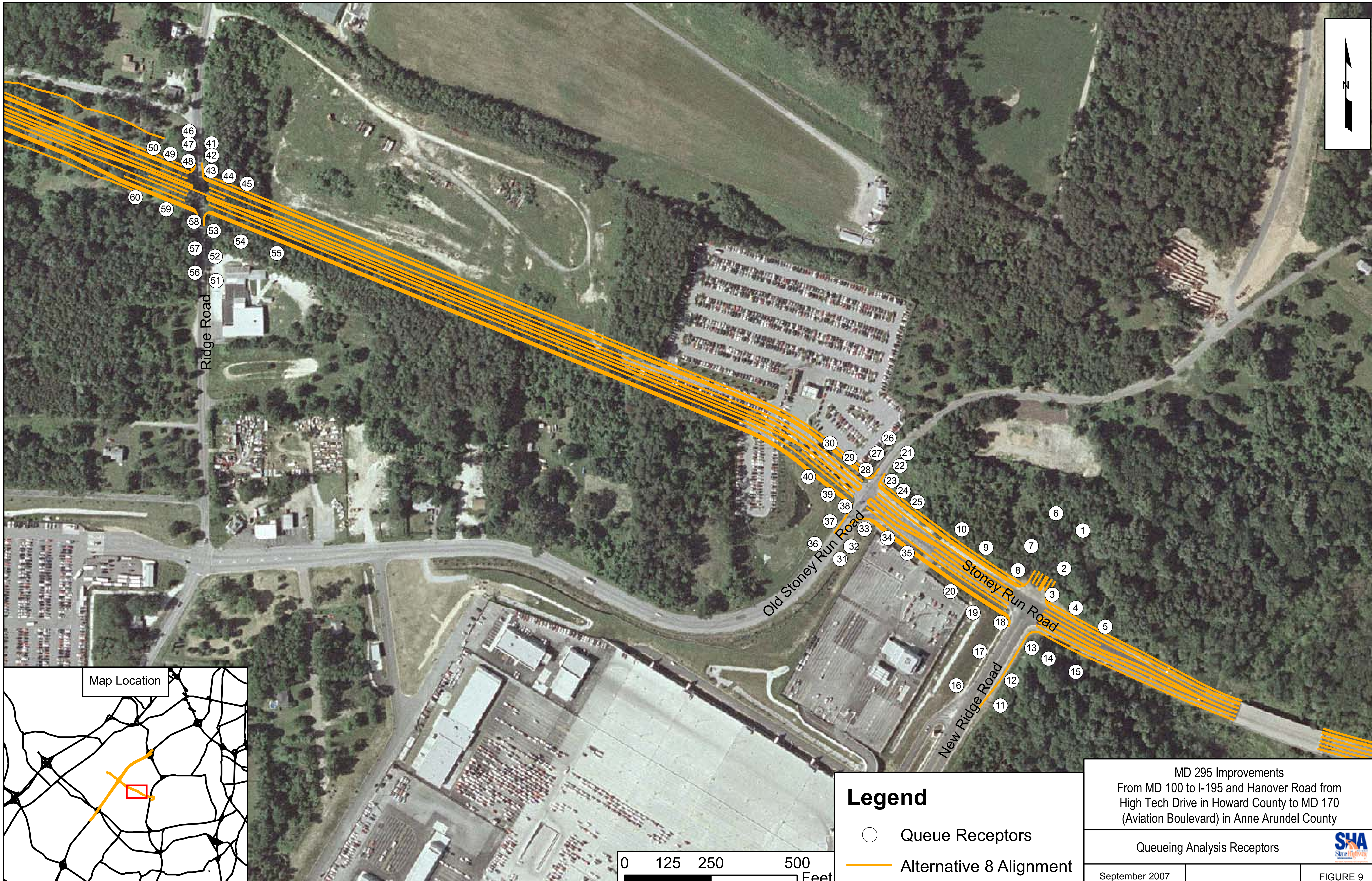
Air Quality Receptor Sites for this project were selected in concert with SHA staff to assure adequate coverage of the project area. Both free-flow and queuing analysis sites were used to predict existing and future air quality indicator pollutant levels. Free-flow receptor sites were generally placed adjacent to portions of the roadway that experience steady-state traffic flow and represent areas of potential human use within the project area, including residential communities and commercial properties. The Queuing Analysis receptor sites were selected to represent a modeling array in close proximity to the three worst-case intersections in the project area anticipated to experience future Level-of-Service (LOS) of class "D" or lower.

The free flow receptor sites are identified on Figures 2 through 8. The queuing analysis receptor sites are identified on Figure 9 – Queuing Analysis Receptor Sites. The queuing analysis sites were developed in accordance with EPA guidelines, specifically EPA-454/R-92-005 "Guideline for Modeling Carbon Monoxide from Roadway Intersection" (November 1992). The queuing analysis sites are uniform for all alternatives, as they share the same design footprint and features for all future Build alternatives. No queuing analysis was performed for the existing case as there are currently no signalized intersections in the project area.

B. Results of the Micro-scale Analysis

None of the receptor sites in the project area yielded worst-case CO emissions in excess of the eight-hour NAAQS of 9.0 ppm. Predicted CO concentrations were consistent through all cases, with the highest future concentrations found (as anticipated) near intersections at the queuing analysis receptors.

The eight-hour concentration levels were derived from the computer modeled one-hour concentrations. Following the computation of the one-hour concentration levels (using the MOBILE 6.2 and CAL3QHC models); a persistence factor is applied to the CO emission levels.



Ridge Road
Old Stoney Run Road
Stoney Run Road
New Ridge Road
Map Location
0 125 250 500 Feet
Legend
Queue Receptors
Alternative 8 Alignment
MD 295 Improvements
From MD 100 to I-195 and Hanover Road from
High Tech Drive in Howard County to MD 170
(Aviation Boulevard) in Anne Arundel County
Queueing Analysis Receptors
September 2007
FIGURE 9

This persistence factor accounts for atmospheric dispersion over time, and is represented as a 0.7 multiplier in accordance with EPA modeling guidelines. The maximum calculated eight-hour CO concentrations are as follows:

- 3.3 ppm for the existing facility;
- 4.1 ppm for Alternative 1 (No-Build);
- 3.2 ppm for Alternatives 3 and 3A;
- 3.2 ppm for Alternative 4 and 4A;
- 3.2 ppm for Alternative 7; and
- 3.2 ppm for Alternative 8.

Table 1, Modeled Free-Flow CO Emissions, shows the individual one-hour and eight-hour free-flow CO concentration levels at each receptor site for each alternative. Table 2, Modeled Queuing Analysis CO Emissions, shows the individual one-hour and eight-hour queue analysis CO concentration levels at each receptor site for the build alternatives. No existing or No-Build queue analysis was done due to a lack of signalized intersections in the existing facility. The highest concentrations for any given alternative have been highlighted in bold in the table.

Table 1. Modeled Free-Flow CO Emissions

Receptor ID	Existing (2004)		Alternative 1 (2030) No-Build		Alternatives 3 and 3A (2030)		Alternatives 4 and 4A (2030)		Alternative 7 (2030)		Alternative 8 (2030)	
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour
FF1	3.5	2.5	4.3	3.0	3.4	2.4	3.4	2.4	3.3	2.3	3.3	2.3
FF2	3.3	2.3	3.5	2.5	3.4	2.4	3.4	2.4	3.4	2.4	3.4	2.4
FF3	3.6	2.5	4.1	2.9	3.6	2.5	3.6	2.5	3.6	2.5	3.7	2.6
FF4	4.7	3.3	5.9	**4.1**	4.2	2.9	4.2	2.9	4.0	2.8	4.4	3.1
FF5	4.5	3.2	3.9	2.7	3.9	2.7	3.9	2.7	3.9	2.7	3.9	2.7
FF6	5.2	3.6	4.4	3.1	4.5	**3.2**	4.5	**3.2**	4.5	**3.2**	4.5	**3.2**
FF7	3.9	2.7	3.6	2.5	3.6	2.5	3.6	2.5	3.6	2.5	3.6	2.5
FF8	3.8	2.7	3.5	2.5	3.5	2.5	3.5	2.5	3.5	2.5	3.5	2.5
FF9	5.3	**3.7**	4.5	3.2	4.6	**3.2**	4.6	**3.2**	4.6	**3.2**	4.6	**3.2**

For reference, the NAAQS for the 1-hour CO concentration is 35 ppm, and the NAAQS for the 8-hour CO concentration is 9 ppm.

Table 2. Modeled Queuing Analysis CO Emissions

Receptor ID	All Build Alternatives (2030)			Receptor ID	All Build Alternatives (2030)			Receptor ID	All Build Alternatives (2030)			Receptor ID	All Build Alternatives (2030)	
	1-hour	8-hour			1-hour	8-hour			1-hour	8-hour			1-hour	8-hour
1	3.8	2.7		16	3.7	2.6		31	3.5	2.5		46	3.6	2.5
2	4.1	2.9		17	3.7	2.6		32	3.5	2.5		47	3.7	2.6
3	4.1	2.9		18	3.9	2.7		33	3.9	2.7		48	4.1	2.9
4	4.0	2.8		19	3.7	2.6		34	4.2	2.9		49	4.0	2.8
5	4.0	2.8		20	3.9	2.7		35	4.1	2.9		50	4.0	2.8
6	3.6	2.5		21	3.7	2.6		36	3.4	2.4		51	3.6	2.5
7	3.7	2.6		22	3.8	2.7		37	3.7	2.6		52	3.6	2.5
8	3.9	2.7		23	4.1	2.9		38	4.0	2.8		53	3.9	2.7
9	3.9	2.7		24	4.1	2.9		39	4.0	2.8		54	3.8	2.7
10	4.0	2.8		25	4.0	2.8		40	4.1	2.9		55	3.9	2.7
11	3.6	2.5		26	3.6	2.5		41	3.5	2.5		56	3.5	2.5
12	3.7	2.6		27	3.8	2.7		42	3.7	2.6		57	3.7	2.6
13	4.0	2.8		28	4.5	**3.2**		43	3.9	2.7		58	4.0	2.8
14	4.0	2.8		29	4.4	3.1		44	3.9	2.7		59	3.8	2.7
15	3.9	2.7		30	4.5	**3.2**		45	3.9	2.7		60	3.8	2.7
Existing and No-Build Queue Analysis emissions have not been calculated due to a lack of signalized intersections														

III. TECHNICAL ANALYSIS

A. Traffic Data

The traffic data used in this air quality assessment was provided by SHA specifically for use in the project-level analysis. The traffic data provided included AM and PM peak-hour traffic for both the existing (2004) and design year (2030). Design year traffic was developed for the No-Build case as well as all of the Build alternatives. The traffic data showed traffic volumes and turning movements for MD 295, MD 100, and all of the associated secondary roadways. The PM peak traffic data was used in this analysis as it represented the consistently highest volumes throughout the project area.

This project is still in the planning phase, and therefore HCS or SYNCRO output sheets for detailed signalized intersection analysis were not available. Sample intersection data was provided by the SHA's Traffic Division for "typical" intersections that are designed to handle volumes similar to those proposed for this project. Additionally, SHA performed a Critical Lane Analysis to determine the anticipated LOS for project intersections. In cases where assumptions were necessary to generate adequate model input data (i.e. typical red/yellow/green/clearance timing for signals and saturation flow rates), these variables were developed with a bias towards generating a conservative worst-case estimate to assure confidence in the results.

The traffic data used in this analysis is located in Appendix A, The "stick" diagrams supplied by SHA were used as the basis for determining traffic volumes for each of the Build alternatives such that vehicular movements were properly assigned to the appropriate upgraded roadway component.

B. Emissions Factors

CO emissions factors are calculated using the MOBILE 6.2 Mobile Source Emission Factor Model. These models incorporate a variety of variable factors including historic temperature data, vehicle fleet parameters and trends, and other region- and project-specific inputs. Anne Arundel and Howard Counties are considered by the EPA as part of the Baltimore air quality region, and as such fall under the jurisdiction of the Baltimore

Metropolitan Council (BMC). The BMC is a Metropolitan Planning Organization (MPO), which is tasked with evaluating regional air quality conformity relative to applicable EPA air quality guidelines. The MPO follows a protocol to determine the affects of proposed transportation improvement projects on regional air quality through an annual conformity analysis. This analysis requires the development of air quality models (and model inputs), including variable data for the MOBILE 6.2 emissions factor model. BMC provided the most recent MOBILE 6.2 input data for use in our analysis including, but not limited to, region-specific fleet registration data, low-emission vehicle penetration, and applicable inspection/maintenance programs. The model was run using wintertime (January) temperature data as per EPA guidelines since violations of the NAAQS for CO are more likely to occur in the coldest months. Minimum and maximum average January temperatures for the project area were gathered from historical weather data; average values of 27.6- and 47.5 degrees Fahrenheit were used for the analysis.

CO emissions factors generated using MOBILE 6.2 are shown in Table 3. These rates are reported in grams/mile, and have been calculated for a variety of travel speeds including idle vehicles. The MOBILE 6.2 data files are contained on the CD-ROM supplied as part of Appendix B.

Table 3. CO Emissions Factors (grams/mile)

Year	Speed (MPH)	CO EF
2004	Idle	120.76
	15	21.75
	27.5	19.46
	40	19.88
	52.5	22.21
	65	23.56
2030	Idle	46.41
	15	9.31
	27.5	8.42
	40	8.59
	52.5	9.43
	65	10.02

MOBILE 6.2 does not have the ability to make a direct calculation of idle emissions factors. The EPA has developed a protocol to generate the idle emission factor from known data. The idle emission factor (grams/mile) is derived by calculating the emissions at the lowest calculable speed in the model (i.e. 2.5 mph) and then multiplying the results by that speed. As anticipated, the idle emission factors represent the worst-case emissions for project roadways. An analysis of emissions factors over time indicates decreased emissions rates in the future case, as would be expected given the technological improvements to fleet vehicles.

C. CAL3QHC Analysis

The CAL3QHC model evaluates the effects of vehicle emissions at free-flow roadway sections as well as at intersections or “hot spots” where CO concentrations may be elevated as a result of sporadic traffic behavior (acceleration, deceleration, and idling while at a traffic signal). The model represents the geometric relationship between the roadway and receptor sites and takes into account factors such as the air pollutant source, wind speed, wind angle, atmospheric stability, roadway width and length, surface roughness, and existing background CO concentrations. The model also considers such factors as intersection type, traffic signal phases, cycle length, and saturation flow rates.

The federal Air Quality guidelines require that worst-case conditions be used for the analysis. Worst-case CAL3QHC meteorological conditions consist of one meter/second wind speed, the worst-case wind angle (variable by receptor site), and an atmospheric stability class of 4. The PM peak-hour traffic was used to generate the worst-case analysis conditions for the project corridor due to anticipated traffic volumes. A default value of 3.0 ppm was used to represent background CO concentrations for the analysis, and is recommended as the default worst-case background concentration per EPA guidelines.

Upon generation of the worst-case one-hour CO concentrations, a persistence factor of 0.7 (as per EPA guideline recommendations) is applied to determine the eight-hour CO concentration levels. The resulting CO concentrations are then compared to the NAAQS to ensure that the project-induced CO concentrations do not yield levels in excess of the national standards. The results have been outlined in Tables 1 and 2.

IV. $PM_{2.5}$ ANALYSIS

A. $PM_{2.5}$ Regional and Hot Spot Conformity Determination

Please see Section I.A. for a comprehensive project description, including the existing environment and the proposed improvements through the transportation corridor.

On January 5, 2005, the EPA designated the Baltimore Region (including Anne Arundel and Howard Counties) as in "non-attainment" for $PM_{2.5}$. This designation became effective on April 5, 2005 following the EPA's notification in the Federal Register. Transportation conformity for the $PM_{2.5}$ standards applies as of April 5, 2006 following the one-year grace period, as provided for within the CAA. At that time, the $PM_{2.5}$ non-attainment areas were mandated to be part of a conforming TIP, including pending federally supported projects. Relative to $PM_{2.5}$, conformity requires an assessment of "projects of air quality concern" as described in 40 CFR 93.123.

Projects that require hotspot analysis of $PM_{2.5}$ are those projects that are Projects of Air Quality concern as outlined in 40 CFR 03.123 (b)(1):

(i) New or expanded highway projects that have a significant number of or significant increase in diesel vehicles;

(ii) Projects affecting intersections that are Level-of-Service D, E, or F with a significant number of diesel vehicles, or those that will change to a Level-of-Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;

(iii) New bus and rail terminal and transfer points that have a significant number of diesel vehicles congregating at a single location;

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and

(v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan submission, as appropriate, as sites of violation or possible violation.

Based on review and analysis of the proposed MD 295 project, it has been determined that the project is not a project of air quality concern under 40 CFR 93.109. The following analysis is offered to support this designation:

- The MD 295 project does not meet the criteria set forth in 40 CFR 93.123(b)(1) as amended to be considered a ***project of air quality concern*** because the project corridor is primarily used by gasoline vehicles. Referencing the EPA's March 2006 Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (EPA420-B-06-902), Appendix A indicates that in order to be considered a project of air quality concern, a project would require average annual daily traffic (AADT) in excess of 125,000 vehicles and a diesel truck percentage in excess of 10%. As outlined in Table 4, AADT on the MD 295 mainline will exceed the AADT threshold in the build scenario, but fall well short of the requisite 10% diesel truck component. Anticipated Hanover Road AADTs are well below the 125,000 threshold with corresponding diesel truck percentages well below 10% (also see Appendix A for traffic data).

Table 4: Percent of Diesel Powered Traffic and Average Annual Daily Traffic (AADT) for the Existing (2004), Year 2030 No-Build, and Year 2030 Build Conditions on the MD 295 Mainline Between MD 100 and I-195 and Hanover Road.

Project Area	Existing	Year 2030 No-Build	Year 2030 Build
MD 295 Mainline			
Percent Diesel	3.09%	3.09%	3.09%
AADT	84,850	118,300	130,900
Hanover Road			
Percent Diesel	6.27%	6.27%	6.27%
AADT, by Segment			
East of Interchange	1,200	5,175	33,050
New Extension	--	--	26,350
Stoney Run Road	12,250	32,600	19,700

- As discussed in the examples to the preamble to the March 10, 2006 Final Rule for PM_{10} and $PM_{2.5}$ Hot Spot Analyses in Project-Level Transportation

Conformity Determination (71FR12491), 40 CFR 93.123(b)(1)(i) has been interpreted as applying only to projects involving a significant increase in the number of diesel transit buses and diesel trucks for new or expanded highway projects. This is consistent with 40 CFR 93.123(b)(1)(iv) which defines projects of air quality concern based on a significant increase in diesel vehicles due to terminal or transfer project expansion. As discussed below, the AADT on the MD 295 mainline will vary by approximately 10% between the build and no-build scenarios, with static diesel truck percentages anticipated.

- The Hanover Road section of the project warrants additional consideration. The peak 2030 No-Build volume in the Hanover Road/Stoney Run Road corridor is 32,600 vehicles per day, predicted to occur on the Stoney Run Road portion of the corridor between New Ridge Road and MD 170 (Table 4). In the 2030 Build scenario, the peak volume is 33,050 vehicles per day (a 1.4% increase) which would occur on Hanover Road immediately east of the proposed interchange. In addition, the newly proposed extension of Hanover Road between Ridge Road and Old Stoney Run Road would have a volume of 26,350 vehicles per day, lower than the No-Build peak level of 32,600 vehicles per day. Moreover, traffic volume on Stoney Run Road between New Ridge Road and MD 170, the peak section in No-Build scenario, would be reduced to 19,700 vehicles per day in Build scenario. The relatively small increase in traffic along the Hanover Road is not sufficient to warrant its consideration as a project of air quality concern.

- Section 176(c) of the CAA and the federal conformity rule requires that transportation plans and programs conform to the intent of the state air quality implementation plan (SIP) through a regional emissions analysis in $PM_{2.5}$ non-attainment areas. Howard and Anne Arundel counties are both located in the Baltimore, MD $PM_{2.5}$ area.

Conclusion

Based on review and analysis of the proposed MD 295 Project Planning Study, it has been determined that the project meets the CAA and 40 CFR 93.109 requirements. These requirements are met for particulate matter without a project level hot-spot analysis since the project has ***not been found to be a project of air quality concern*** as defined under 40 CFR 93.123(b)(1). Since the project meets the CAA and 40 CFR 93.109 requirements, the project will not cause or contribute to a new violation of the $PM_{2.5}$ National Ambient Air Quality Standards, or increase the frequency or severity of a violation.

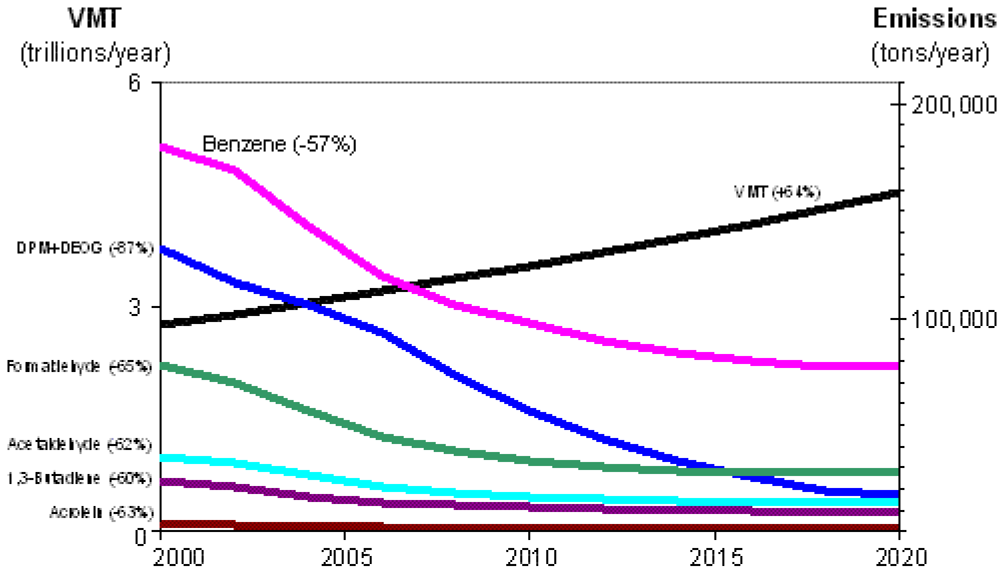
The project area falls under the jurisdiction of the Baltimore Regional Transportation Board (BRTB). The BRTP is the federally recognized Metropolitan Planning Organization for transportation planning in the Baltimore Region. Members of the Baltimore Metropolitan Council (BMC) Board serve on the BRTB, and the BMC provides technical and staff support to the BRTB. Anne Arundel and Howard counties are both considered to be in "non-attainment" for $PM_{2.5}$. The BRTB approved the 2007-2011 TIP and the 2004 Baltimore Regional Transportation Plan on August 22, 2006, and has concluded that the region's transportation plan and program are in conformity with the SIP relative to air quality goals. Therefore, the MD 295 project has been included in a conforming plan and program in accordance with 40 CFR 93.115. The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51 and 93.

V. MOBILE SOURCE AIR TOXICS (MSAT) ANALYSIS

FHWA *Guidance on Air Toxic Analysis in NEPA Documents*, requires analysis of Mobile Source Air Toxics (MSAT) under specific conditions. The EPA has designated six prioritized MSATs which are known or probable carcinogens, or can cause chronic respiratory effects. The six prioritized MSATs are: Benzene, Acrolein, Formaldehyde, 1,3-Butadiene, Acetaldehyde, and Diesel Exhaust (Diesel Exhaust Gases and Diesel Particulate Matter). The MD 295 project would be considered in the category: "***Projects with Low Potential MSAT Effects"***, as described in the referenced guidance. An example of this type of project is a minor widening project and new interchanges, where design year traffic (AADT) is not projected to exceed 150,000. Projects in this category may require a qualitative MSAT analysis.

For each alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same. The VMT estimated for the build alternative will be higher than the No-Build alternative because the additional access to Hanover Road via the proposed MD 295 interchange may attract re-routed trips from elsewhere in the transportation network. This could lead to an increase in VMT that would lead to higher MSAT emissions for the action alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is also offset somewhat by lower MSAT emission rates due to increased speeds, because according to EPA's MOBILE 6.2 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models. In addition, construction of interchanges to replace at-grade intersections will reduce idling, thereby reducing emissions. Furthermore, at both the project location and regionally, MSAT concentrations will decrease in future years due to EPA's vehicle emission and fuel regulations. Refer to the graph below.

U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 2000-2020



Source: Memorandum - Interim Guidance on Air Toxic Analysis in NEPA Documents, US Department of Transportation, Federal Highway Administration, February 2006.

Included herein is a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the build alternatives. Due to these limitations, the following discussion is included in accordance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

- Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

- The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. The tools to predict how MSATs disperse are also limited. Even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude reaching meaningful conclusions about project-specific health impacts. Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses. The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants.

- As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions if any from the build alternatives.

In summary, under any build alternative in the design year, it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No-Build alternative, due to the EPA MSAT reduction programs and reduced VMT associated with more direct routing. In comparing various project alternatives, MSAT levels could be higher under the build alternatives than the No-Build Alternative. However, as discussed above, the magnitude and the duration of these potential increases compared to the No-Build Alternative cannot be accurately quantified due to the inherent deficiencies of current models. In addition, on a regional basis, the EPA vehicle and fuel regulations coupled with fleet turnover will cause region-wide MSAT levels to be significantly lower than today in almost all cases.

REFERENCES

40 CFR, Part 50, 2004. *Title 40, Code of Federal Regulations, Part 50. National primary and Secondary Ambient Air Quality Standards.* Environmental Protection Agency.

40 CFR, Part 51, 2004. *Title 40, Code of Federal Regulations, Part 51. Requirements for Preparation, Adoption, and Submittal of Implementation Plans.* Environmental Protection Agency.

40 CFR, Part 93, 2006. *Title 40, Code of Federal Regulations, Part 93. Determining Conformity of Federal Actions to State or Federal Implementation Plans.* Environmental Protection Agency.

Complete Transportation Conformity Regulations that Incorporate the March 10, 2006 Final Rule and all Previous Rulemakings. Office of Natural and Human Environment, Federal Highway Administration. March, 2006.

EPA-420/R-03-010. *User's Guide to MOBILE6.1 and MOBILE6.2, Mobile Source Emission Factor Model.* Environmental Protection Agency. August, 2003.

EPA-420/B-06-902. *Transportation Conformity Guidance for Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas.* Environmental Protection Agency. March, 2006.

EPA-454/R-92-005. *Guidelines for Modeling Carbon Monoxide From Roadway Intersections.* Environmental Protection Agency. November, 1992.

EPA-454/R-92-006. *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway intersections.* September, 1995.

EPA-420/F-06-022. *Transportation Conformity Final Rule: PM_{10} and $PM_{2.5}$ Hot-Spot Analyses in Project-Level Transportation Conformity Determinations for the PM_{10} and $PM_{2.5}$ National Ambient Air Quality Standards.* February, 2006.

Clean Air Act Amendments of 1990 (CAAA), 101st U.S. Congress, U.S. Government Printing Office, Washington, D.C., November 1990.

APPENDIX A

Air Quality Technical Files

Robert L. Ehrlich, Jr., *Governor*
Michael S. Steele, *Lt. Governor*

SHA State Highway Administration — Driven to Excel
Maryland Department of Transportation

Robert L. Flanagan, *Secretary*
Neil J. Pedersen, *Administrator*

MEMORANDUM

TO: Mr. Bruce M. Grey
Deputy Director
Office of Planning and
Preliminary Engineering

ATTN: Mr. Joseph Kresslein
Assistant Division Chief
Project Planning Division

FROM: Joseph F. Finkle, Sr.
Assistant Division Chief
Travel Forecasting Section

DATE: May 12, 2006

SUBJECT: Project No: AA372A11
MD 295 Project Planning Study
MD 295 from MD 100 to I-195
Hanover Road from High Tech Road to MD 170
Anne Arundel County

In response to your memorandum requesting environmental traffic data on the subject project, we offer the following:

- Attached are sketches showing Average Daily Traffic (ADT) and AM/PM Peak Hour traffic volumes for existing year (2004) and design year (2030) No-Build and Build conditions. Notably, 2030 No-Build volumes include improvements from the MD 295: I-195 to I-695 Highway Design project.

- ADT and Design Hour Volume breakdown of truck percentages:

MD 295

Average Daily Traffic	**Light**	**Medium**	**Heavy**	**Total**
Gas Powered	0.44%	1.41%	0.06%	1.91%
Diesel Powered	0.44%	1.41%	1.24%	3.09%
			Total:	**5.00%**

Design Hour Volume	**Light**	**Medium**	**Heavy**	**Total**
Gas Powered	0.24%	0.87%	0.04%	1.15%
Diesel Powered	0.24%	0.87%	0.74%	1.85%
			Total:	**3.00%**

Hanover Road Average Daily Traffic	**Light**	**Medium**	**Heavy**	**Total**
Gas Powered	4.74%	0.96%	0.03%	5.73%
Diesel Powered	4.74%	0.96%	0.57%	6.27%
			Total:	**12.00%**

Design Hour Volume	**Light**	**Medium**	**Heavy**	**Total**
Gas Powered	3.40%	1.20%	0.04%	4.64%
Diesel Powered	3.40%	1.20%	0.76%	5.36%
			Total:	**10.00%**

- Please see the attached diurnal curves
- Peak and Off Peak operating speeds (AM/PM)

MD 295

2030 No-Build: LOS F/F (4 lanes)
Peak Speed: 16.7.7/18.6
Off Peak Speed: 65

2030 Build: LOS E/D (6 lanes)
Peak Speed: 58.5/59.8
Off Peak Speed: 65

Hanover Road

2030 No-Build: LOS F/F (2 lanes)
Peak Speed: 19.8/17.4
Off Peak Speed: *45*

2030 Build: LOS B/B (4 lanes)
Peak Speed: 45/45
Off Peak Speed: 45

- LOS C, D, and E volumes/operating speeds:

MD 295

LOS C: No-Build Two Way Volume (4 Lane)- 6,290 vph/ 65 mph
Build Two Way Volume (6 Lane) - 9,430 vph/ 65 mph
LOS D: No-Build Two Way Volume (4 Lane) – 7,820 vph/ 59.8 mph
Build Two Way Volume (6 Lane)– 11,730 vph/ 59.8 mph
LOS E: No-Build Two Way Volume (4 Lane)– 8,790 vph/ 52.3 mph
Build Two Way Volume (6 Lane)– 13,190 vph/ 52.3 mph

Hanover Road

LOS C:	No-Build Two Way Volume (2 Lane)- 2,220 vph/ 45 mph
	Build Two Way Volume (4 Lane)- 4,340 vph/ 45 mph
LOS D:	No-Build Two Way Volume (2 Lane) – 2,940 vph/ 44.2 mph
	Build Two Way Volume (4 Lane)– 5,740 vph/ 44.2 mph
LOS E:	No-Build Two Way Volume (2 Lane)– 3,610 vph/ 41.9 mph
	Build Two Way Volume (4 Lane)– 7,040 vph/ 41.9 mph

If we may be of any further assistance, please feel free to contact the writer or Ms. L'Kiesha Markley for the Travel Forecasting Section at 410-545-5580.

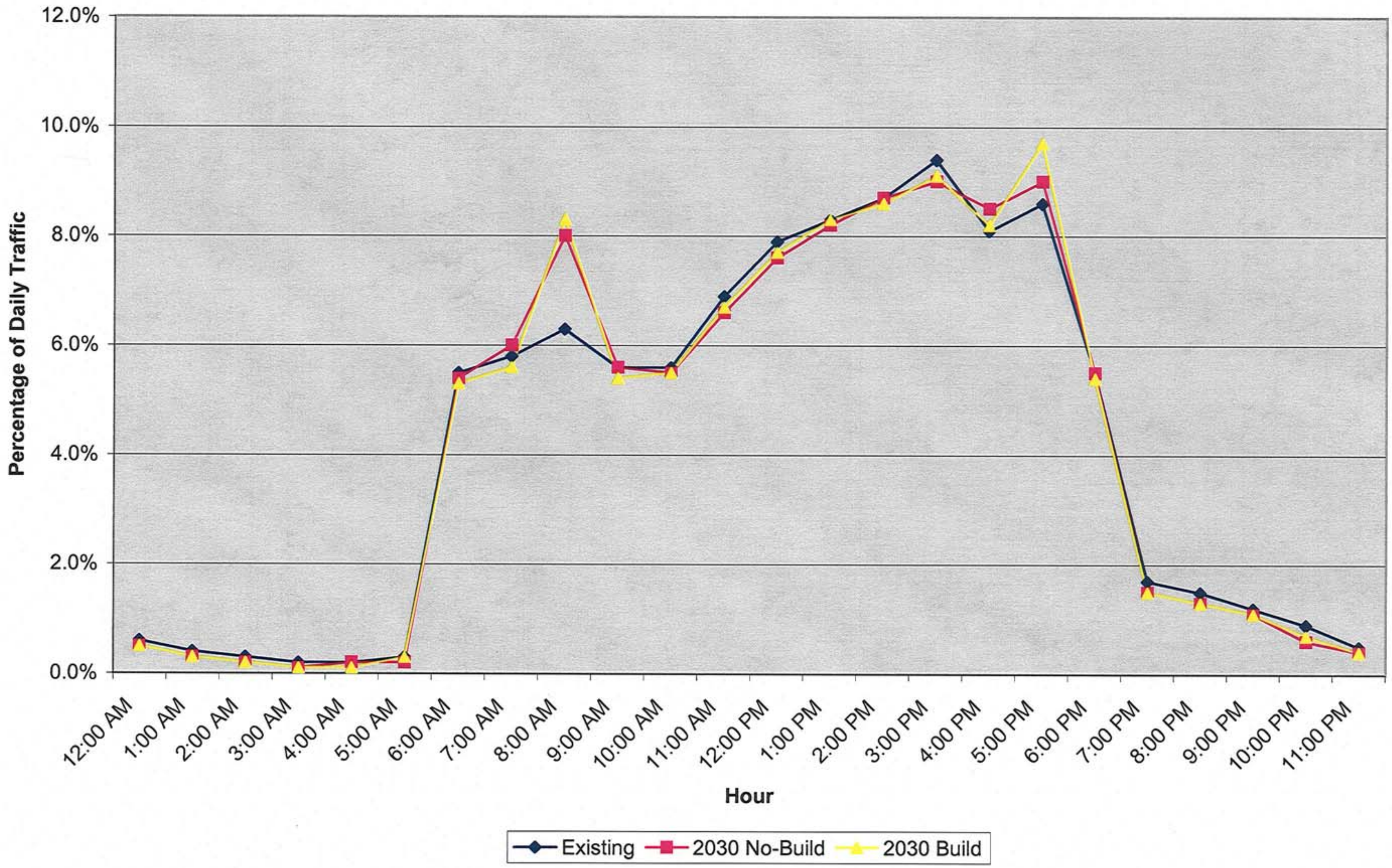
By: Derek Gunn

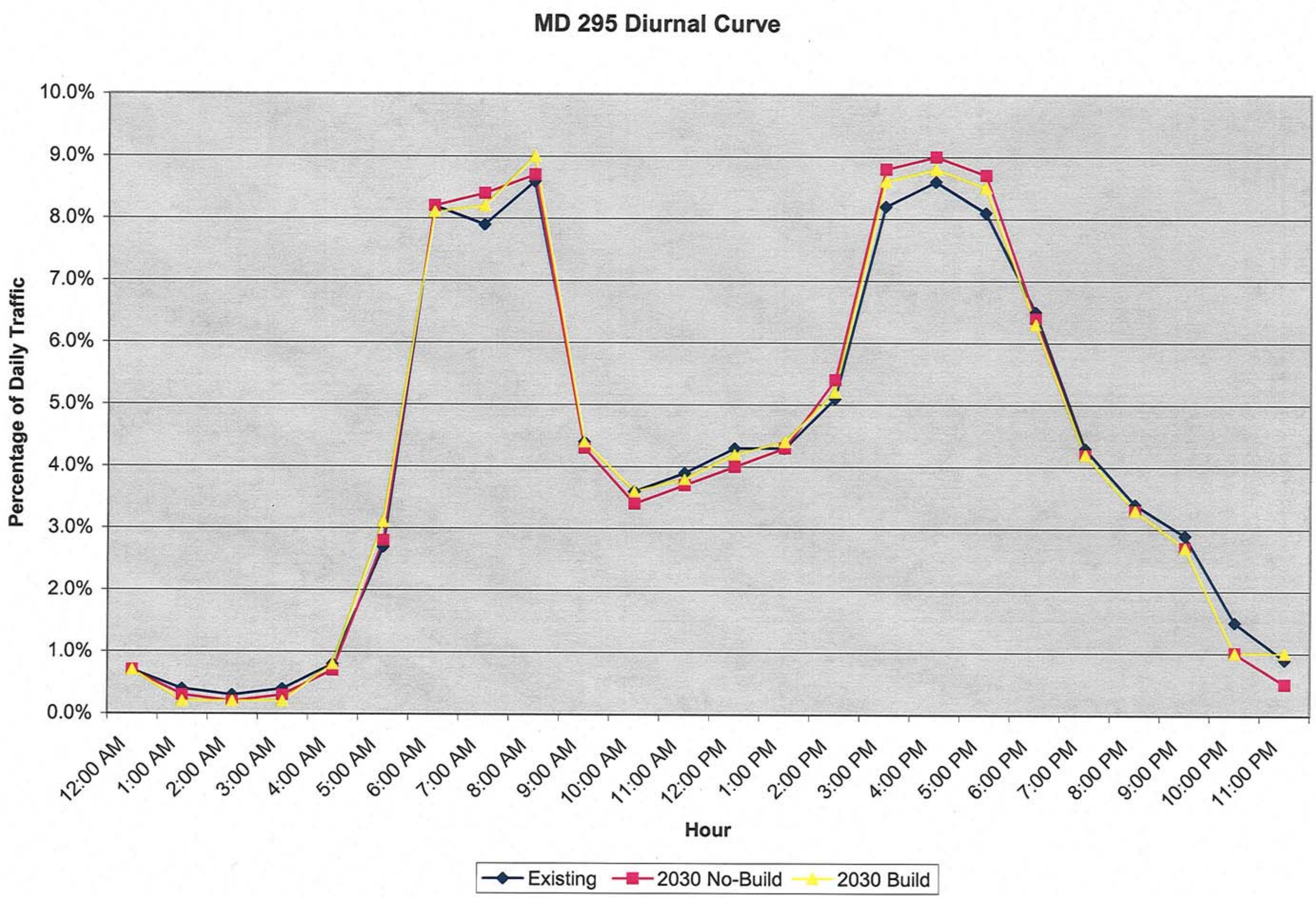
Derek Gunn
Travel Forecasting Section
Project Planning Division

Attachments

cc: Ms. Theresa Christian
Mr. Gary Green
Mr. Vaughn Lewis
Ms. L'Kiesha Markley

Hanover Road Diurnal Curve




MD 295 Diurnal Curve
Percentage of Daily Traffic
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour
Existing
2030 No-Build
2030 Build

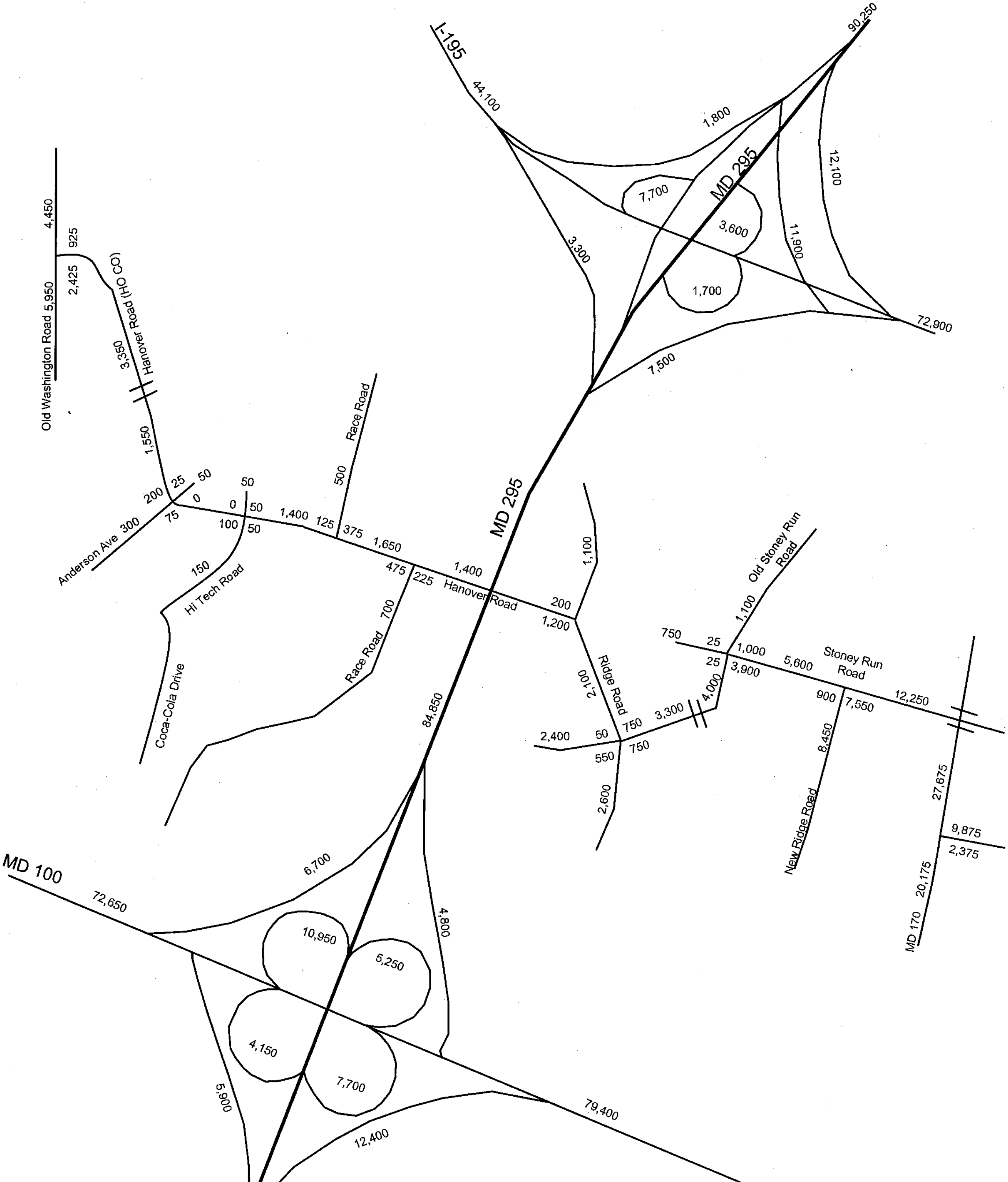
MD 295

	2004 Existing	2030 No-Build	2030 Build
12:00 AM	0.7%	0.7%	0.7%
1:00 AM	0.4%	0.3%	0.2%
2:00 AM	0.3%	0.2%	0.2%
3:00 AM	0.4%	0.3%	0.2%
4:00 AM	0.8%	0.7%	0.8%
5:00 AM	2.7%	2.8%	3.1%
6:00 AM	8.2%	8.2%	8.1%
7:00 AM	7.9%	8.4%	8.2%
8:00 AM	**8.6%**	**8.7%**	**9.0%**
9:00 AM	4.4%	4.3%	4.4%
10:00 AM	3.6%	3.4%	3.6%
11:00 AM	3.9%	3.7%	3.8%
12:00 PM	4.3%	4.0%	4.2%
1:00 PM	4.3%	4.3%	4.4%
2:00 PM	5.1%	5.4%	5.2%
3:00 PM	8.2%	8.8%	8.6%
4:00 PM	**8.6%**	**9.0%**	**8.8%**
5:00 PM	8.1%	8.7%	8.5%
6:00 PM	6.5%	6.4%	6.3%
7:00 PM	4.3%	4.2%	4.2%
8:00 PM	3.4%	3.3%	3.3%
9:00 PM	2.9%	2.7%	2.7%
10:00 PM	1.5%	1.0%	1.0%
11:00 PM	0.9%	0.5%	1.0%

Hanover Road

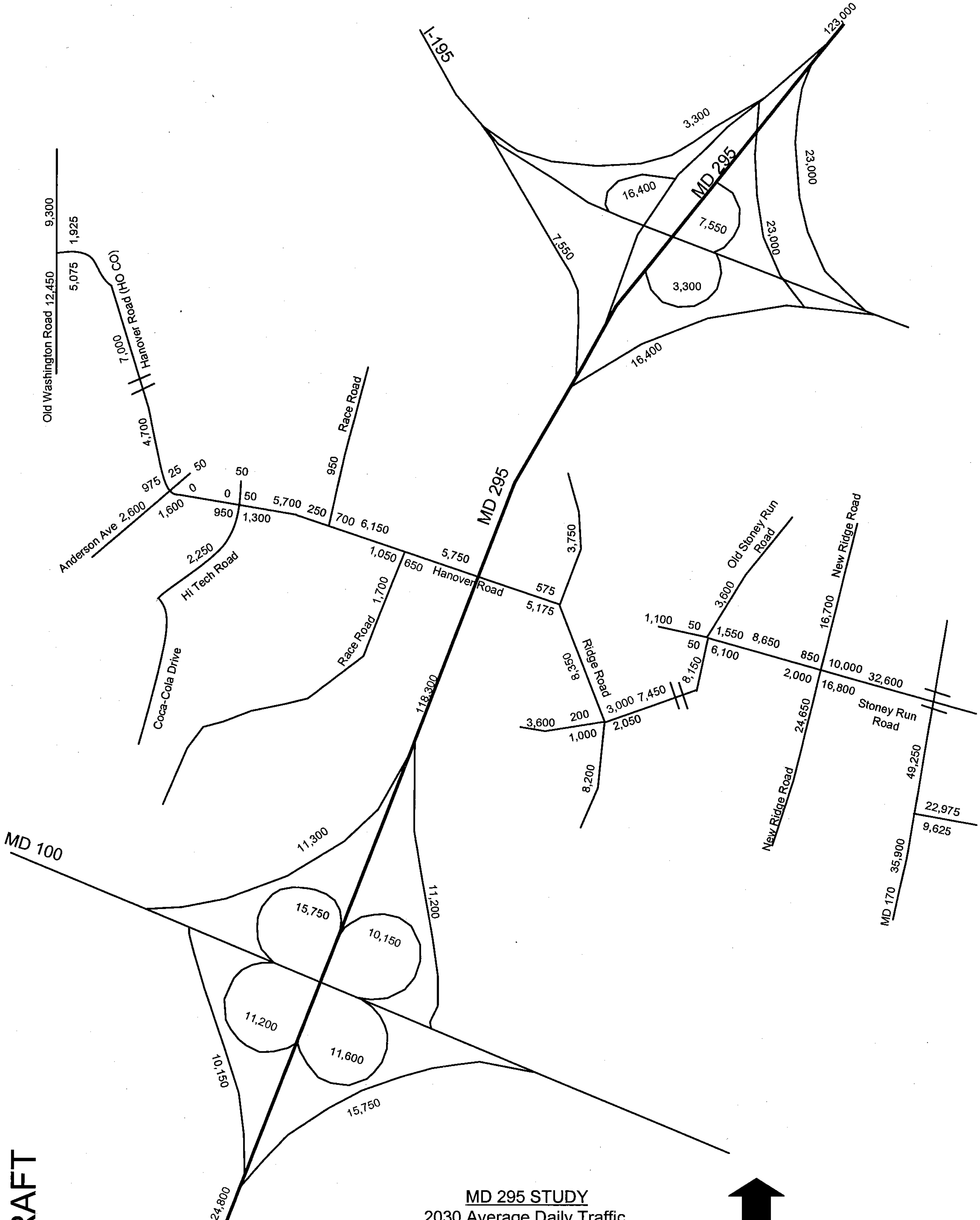
	2004 Existing	2030 No-Build	2030 Build
12:00 AM	0.6%	0.5%	0.5%
1:00 AM	0.4%	0.3%	0.3%
2:00 AM	0.3%	0.2%	0.2%
3:00 AM	0.2%	0.1%	0.1%
4:00 AM	0.2%	0.2%	0.1%
5:00 AM	0.3%	0.2%	0.3%
6:00 AM	5.5%	5.4%	5.3%
7:00 AM	5.8%	6.0%	5.6%
8:00 AM	**6.3%**	**8.0%**	**8.3%**
9:00 AM	5.6%	5.6%	5.4%
10:00 AM	5.6%	5.5%	5.5%
11:00 AM	6.9%	6.6%	6.7%
12:00 PM	7.9%	7.6%	7.7%
1:00 PM	8.3%	8.2%	8.3%
2:00 PM	8.7%	8.7%	8.6%
3:00 PM	9.4%	9.0%	9.1%
4:00 PM	8.1%	8.5%	8.2%
5:00 PM	**8.6%**	**9.0%**	**9.7%**
6:00 PM	5.5%	5.5%	5.4%
7:00 PM	1.7%	1.5%	1.5%
8:00 PM	1.5%	1.3%	1.3%
9:00 PM	1.2%	1.1%	1.1%
10:00 PM	0.9%	0.6%	0.7%
11:00 PM	0.5%	0.4%	0.4%
		100.0%	100.3%

DRAFT



<u>MD 295 STUDY</u>
2004 Average Daily Traffic
Existing Volumes
MD 295 from MD 100 to I-195
Hanover Road from AA Line to MD 170

Not to Scale



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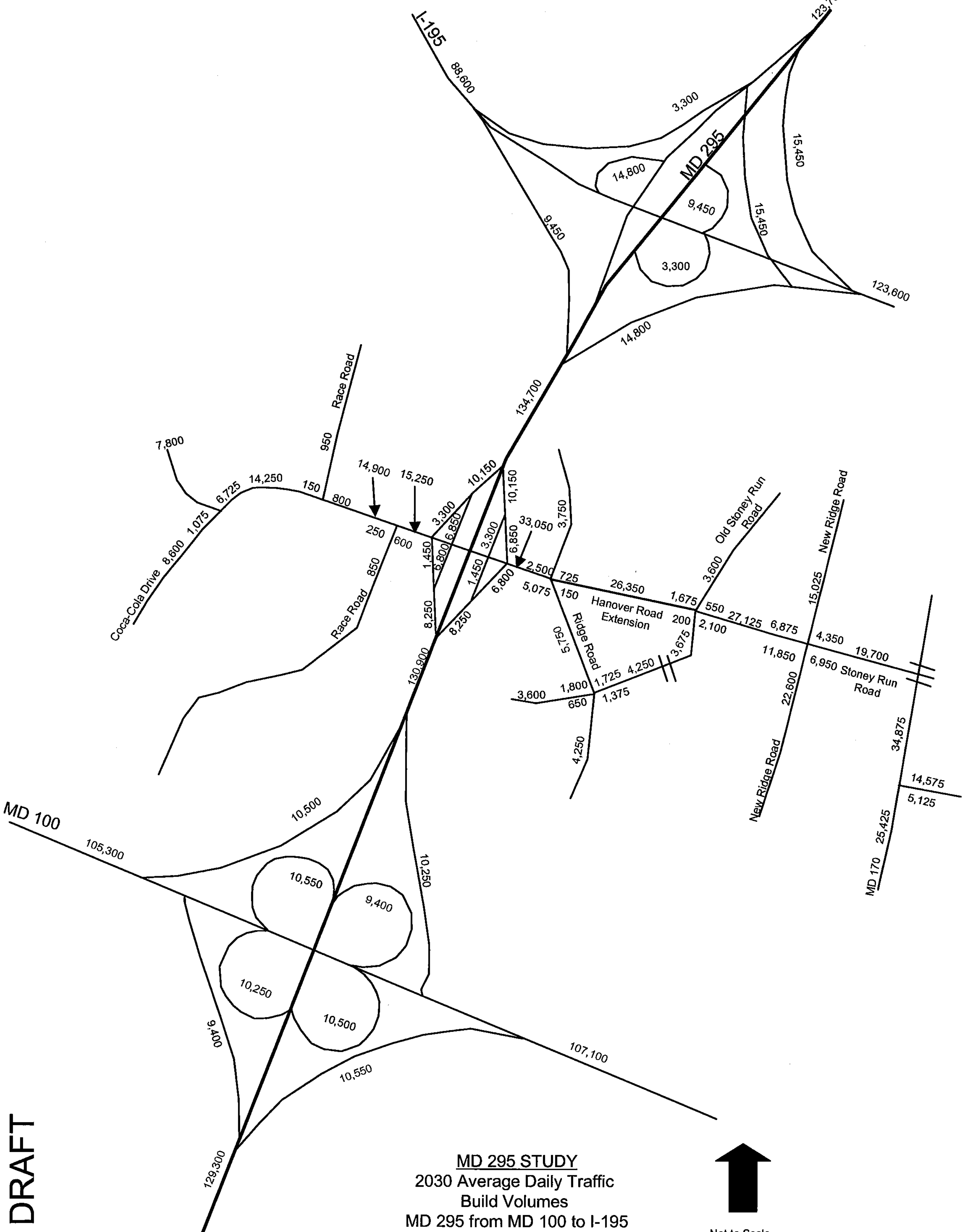
MD 295 STUDY
2030 Average Daily Traffic
No Build Volumes
MD 295 from MD 100 to I-195
Hanover Road from AA Line to MD 170



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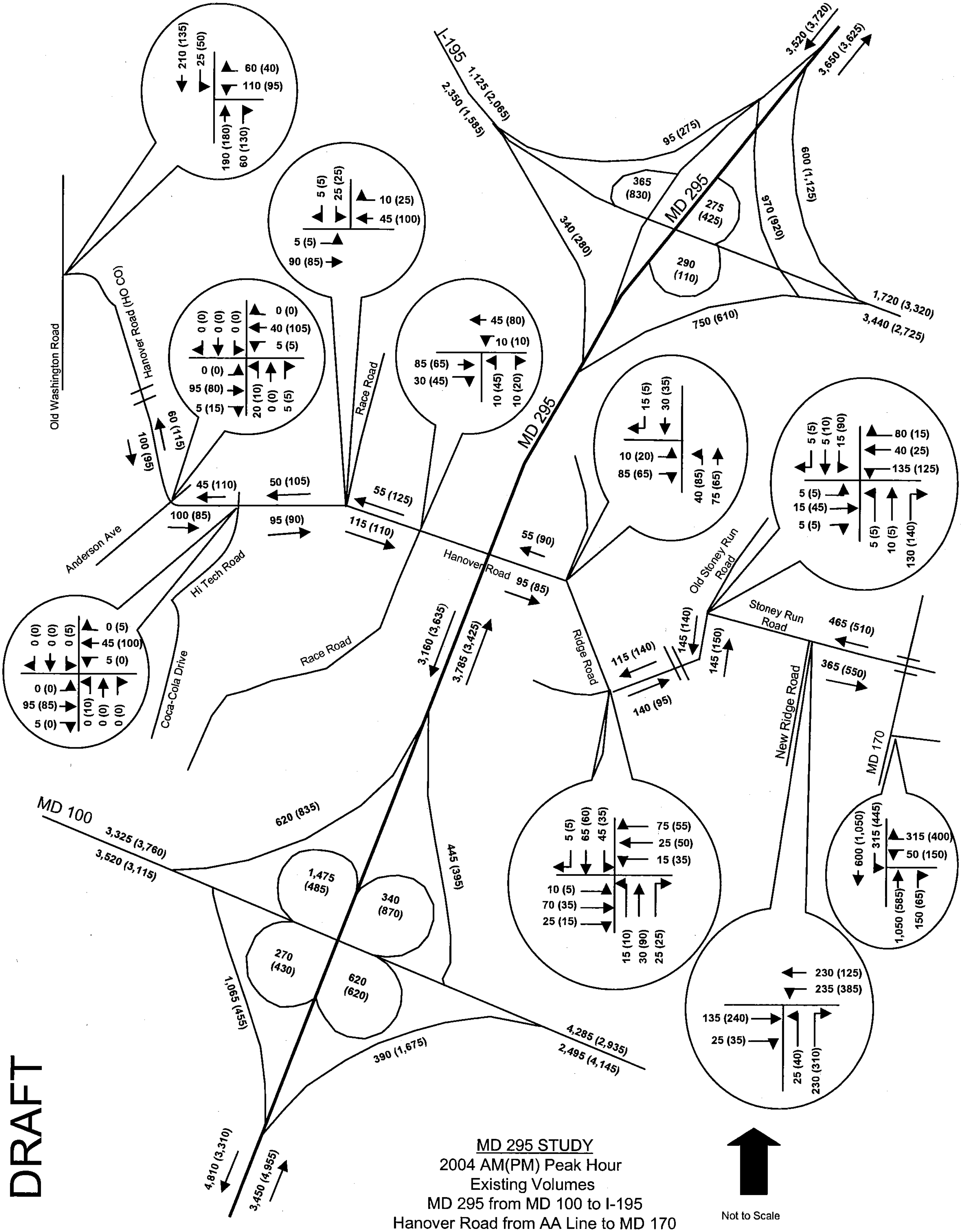
MD 295 STUDY
2030 Average Daily Traffic
Build Volumes
MD 295 from MD 100 to I-195
Hanover Road from AA Line to MD 170



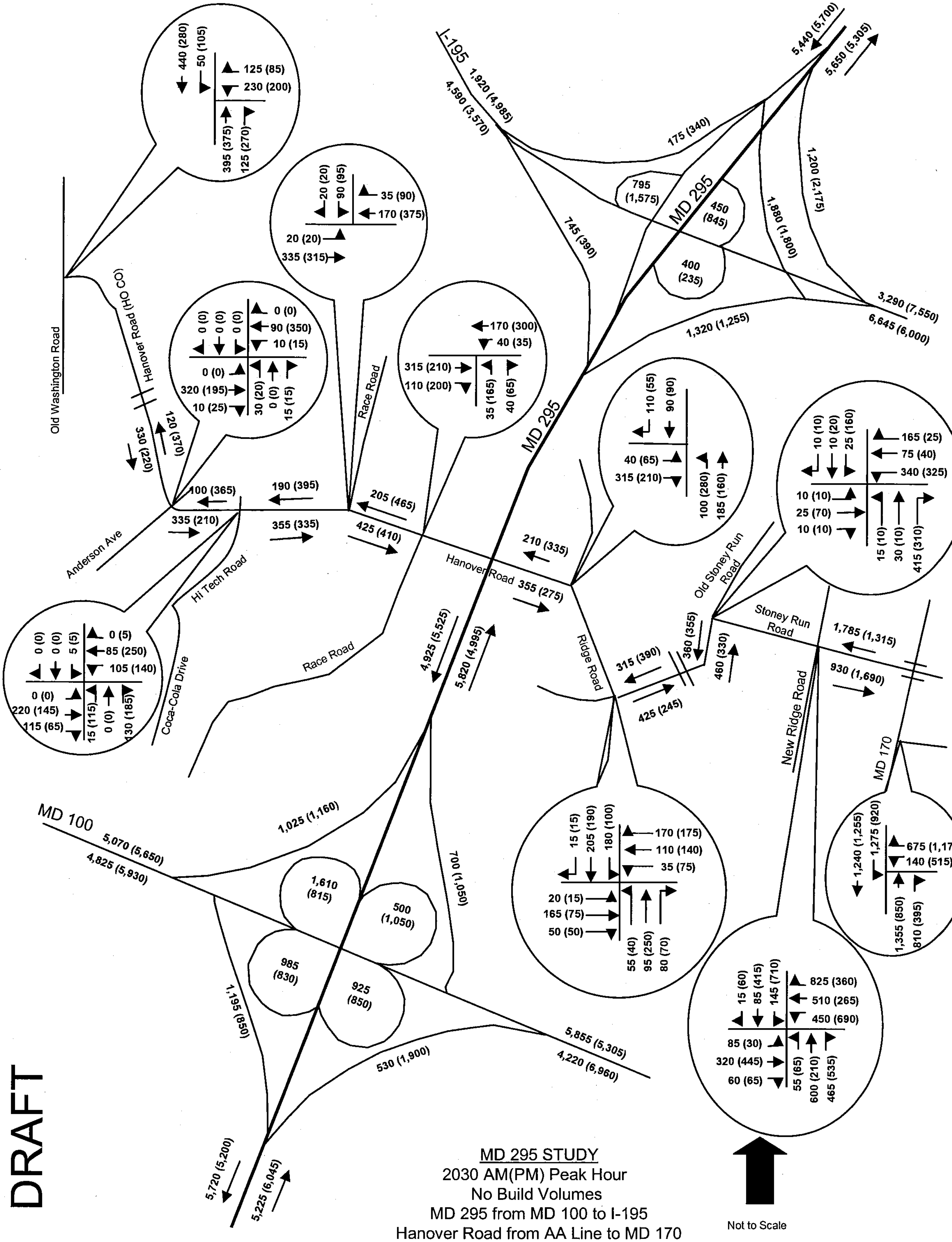
MD 295 STUDY

2004 AM(PM) Peak Hour

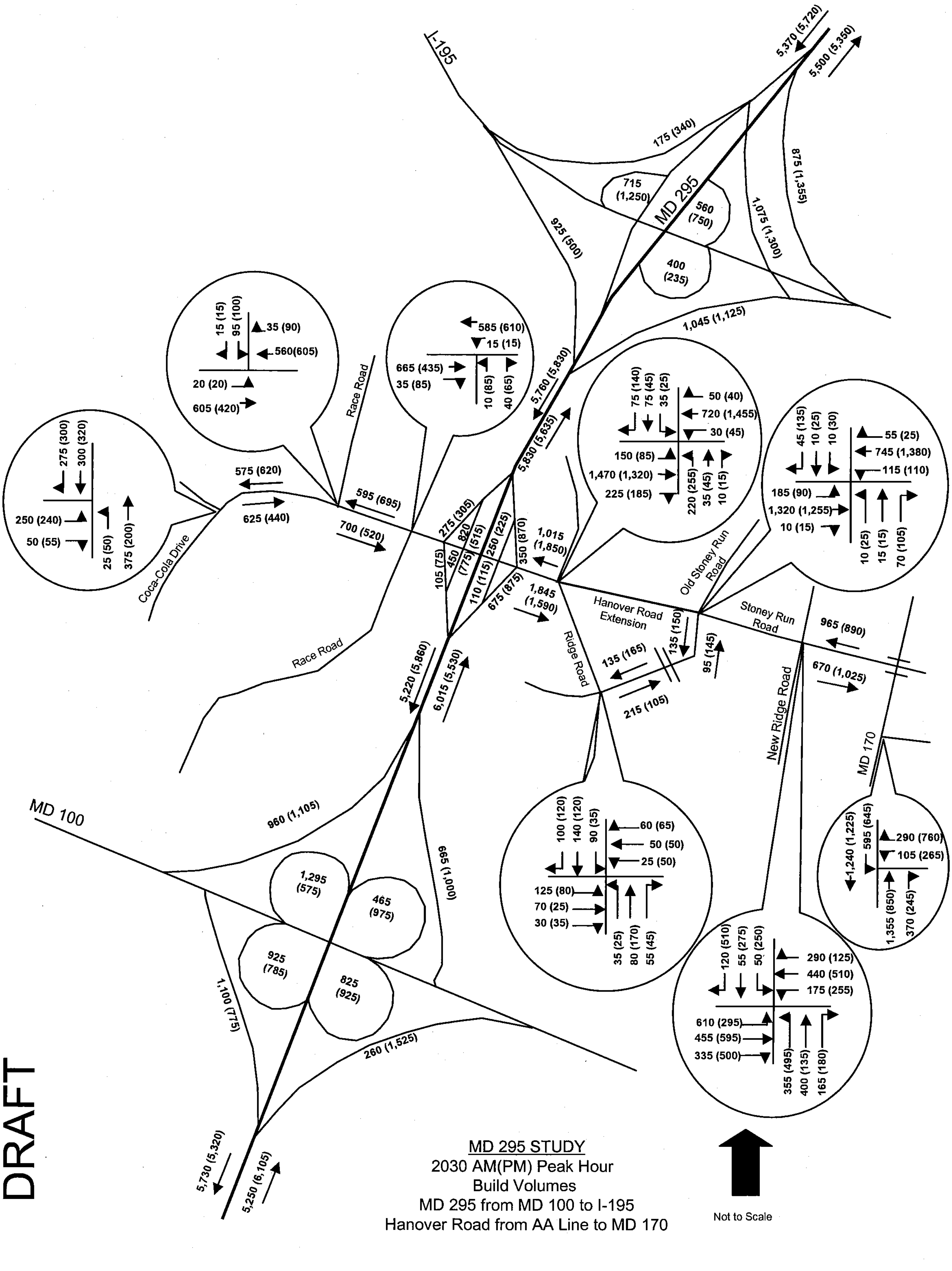
Existing Volumes

MD 295 from MD 100 to I-195

Hanover Road from AA Line to MD 170



MD 295 STUDY
2030 AM(PM) Peak Hour
No Build Volumes
MD 295 from MD 100 to I-195
Hanover Road from AA Line to MD 170



MD 295 STUDY

2030 AM(PM) Peak Hour
Build Volumes
MD 295 from MD 100 to I-195
Hanover Road from AA Line to MD 170

MD 295, Baltimore Washington Parkway

TIP Id #	61-0501-41	**Year of Operation**	2010
Agency	State Highway Administration	**Project Type**	Roadway widening
Project Category	Highway Capacity	**Functional Class**	Freeway
Conformity Status	Not Exempt	**Physical Data**	1.5 miles / 4-lane divided highway
CIP/CTP Page#	AA-2		

Description	Justification
Widen MD 295 from 4 to 6 lanes from I-695 (Baltimore Beltway) to I-195.	This project will ease growing congestion and improve access to one of the State's economic engines, the Baltimore-Washington International Thurgood Marshall Airport.

APPENDIX B

MOBILE 6.2 and CAL3QHC Emissions Models

(CD-ROM)